FIFTY-SEVENTH REPORT OF THE STATE MINERALOGIST

AN CAMPBELL
State Mineralogist and
Chief, Division of Mines

CALIFORNIA DIVISION OF MINES
Ferry Building, San Francisco, 1961

STATE OF CALIFORNIA

EDMUND G. BROWN, *Governor*

DEPARTMENT OF NATURAL RESOURCES

DeWITT NELSON, *Director*

DIVISION OF MINES

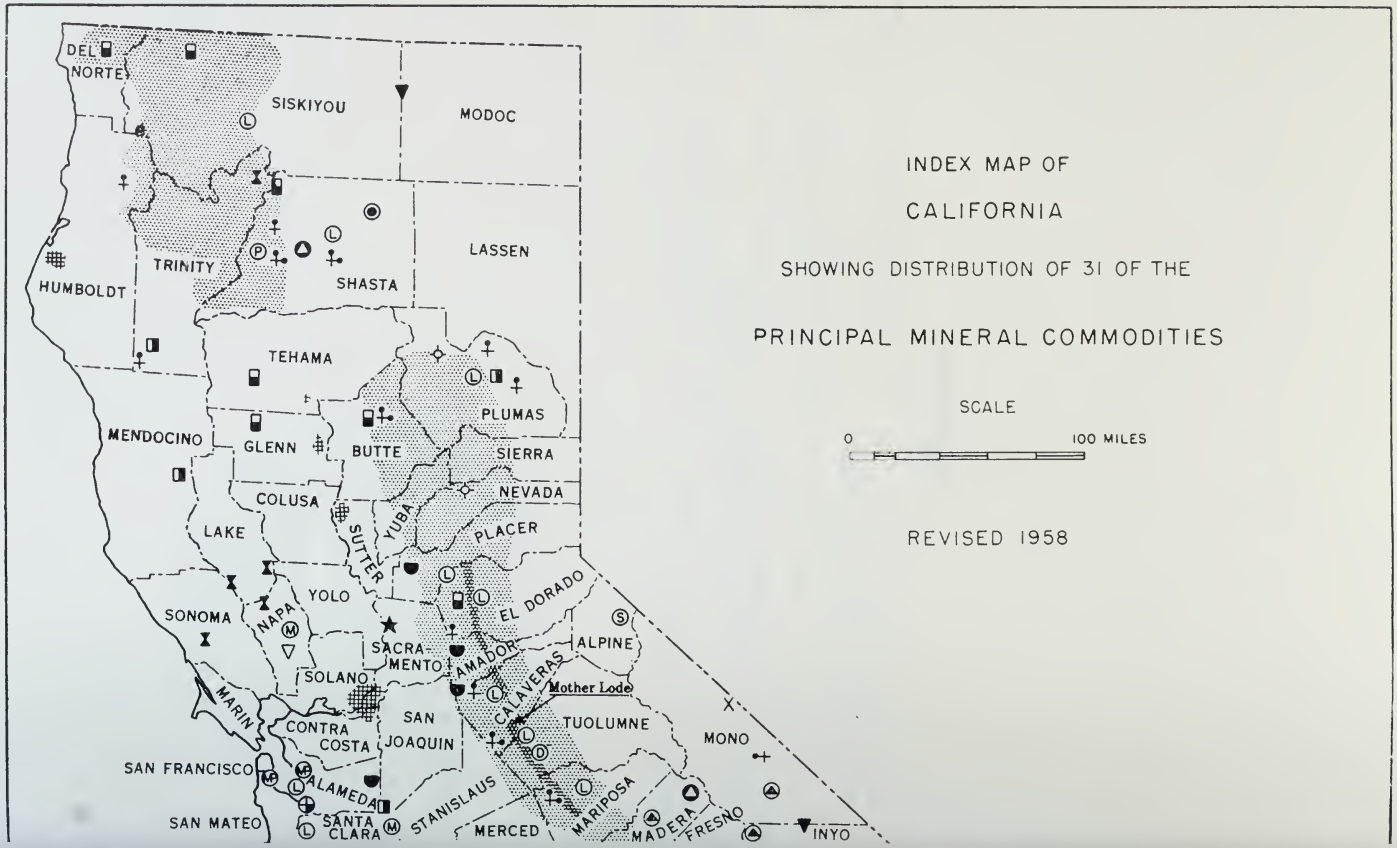
IAN CAMPBELL, *Chief*

Fifty-seventh Report of the State Mineralogist

Price $2.00

CONTENTS

	Page
Report of the Division of Mines for the 111th Fiscal Year, by Ian Campbell, Chief, and Staff	7
California mineral commodities in 1959, by Fenelon F. Davis	77
Activities of the Geologic Division, U. S. Geological Survey, in California in 1959-60, by Charles A. Anderson	119
Directory of mineral producers in 1959, by Fenelon F. Davis and Harold B. Goldman	125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MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
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INDEX MAP OF
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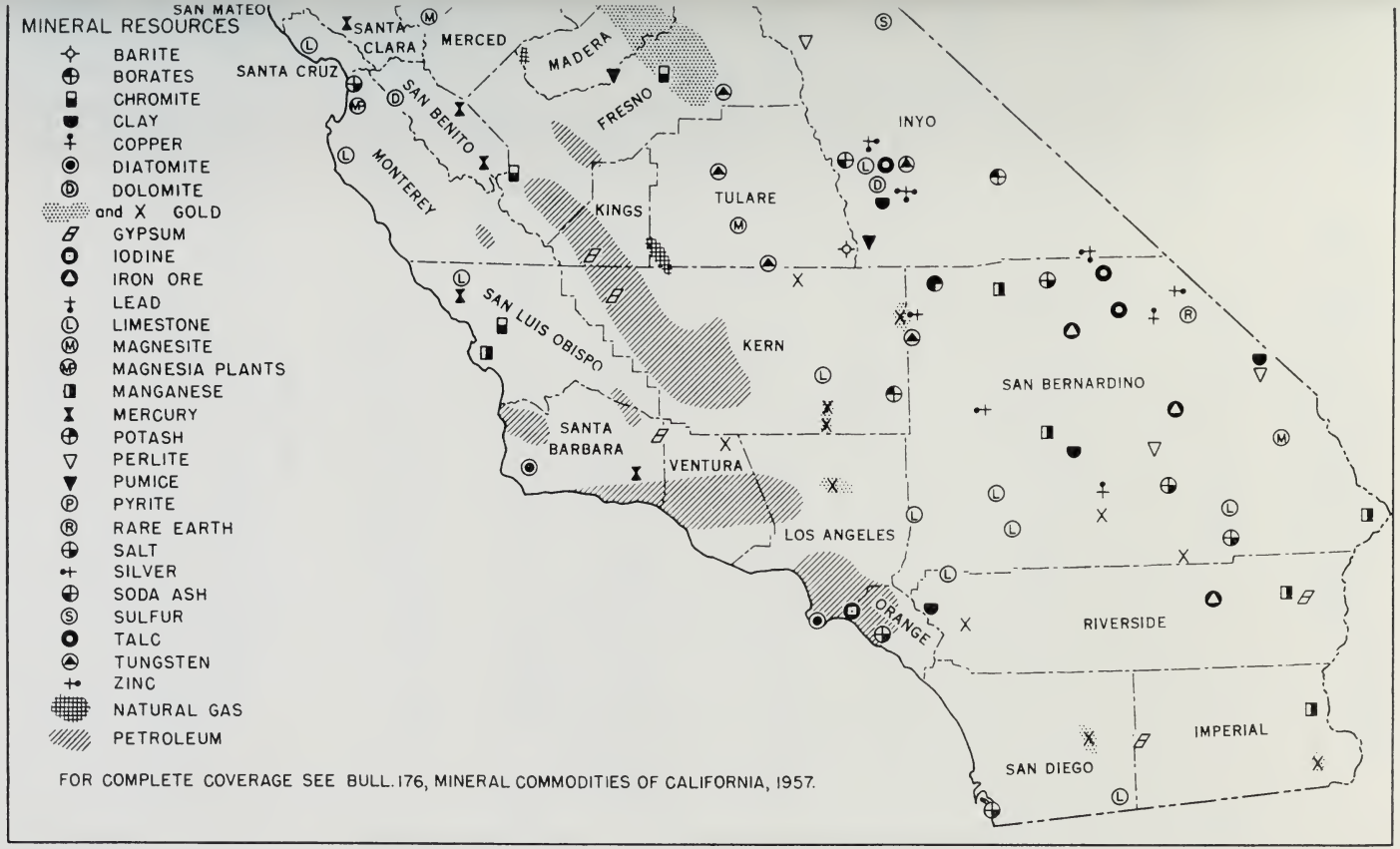
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ORANGE
SAN BERNARDINO
RIVERSIDE
IMPERIAL
SAN DIEGO

ANNUAL REPORT OF THE DIVISION OF MINES FOR THE 111th FISCAL YEAR

By Ian Campbell and Staff

OUTLINE OF REPORT

	Page
Letter of transmittal	9
Abstract	11
I. Introduction	12
II. Aims and functions of the Division of Mines	12
A. The Division of Mines enters the 1960s	12
B. Organizational position of the Division of Mines	13
C. The place of the mineral industry	15
D. The role of the Division of Mines	16
III. The year's accomplishments	16
A. Publications	16
B. New State Geologic Map	20
C. County reports	23
D. Mineral commodity investigations	24
E. Miscellaneous mapping projects	27
F. Mineral research	29
G. Public services	31
IV. Matters of historical, statistical, cooperative, and administrative interest	40
A. California's mineral industry	40
B. Staff of the Division	42
C. Financial statement	46
D. Administration of the Division	46
E. Cooperative programs	52
Report of the U. S. Geological Survey on cooperative studies of mineralized areas in California (fiscal year 1960), by Allan B. Griggs	52
Report of the U. S. Bureau of Mines on cooperative mineral resources and research studies in California (fiscal year 1960), by R. B. Maurer	58
Department of Mineral Technology, University of California	61
Map and manuscript purchase program	61
Other agencies	61
F. Summary and recommendations	62
Appendix	65
Public Resources Code: authority for operation of the Division of Mines	65
Mineral accessions	67
Books added to the library during fiscal year 1959-60	68

Illustrations

Figure 1.	Organization chart, Department of Natural Resources	15
Figure 2.	Plan and progress of the new Geologic Map of California	21
Figure 3.	Index and map of member societies of the California Federation of Mineralogical Societies	38
Figure 4.	Chart showing population and the value of mineral production in California since 1905	43
Photo 1.	The Geysers Power Plant	18
Photo 2.	Division of Mines exhibit at California State Fair	19
Photo 3.	Miocene-Cretaceous unconformity	75

LETTER OF TRANSMITTAL

Mr. DeWitt Nelson
Director, Department of Natural Resources
Sacramento, California

Sir: I have the honor to transmit herewith the Annual Report of the Division of Mines for the 111th fiscal year, July 1, 1959 to June 30, 1960.

For a number of reasons, there has been delay in completing this report. Fortunately this deferment has permitted us to include certain items which fully justify the delay. In particular I would call your attention to the useful current summary of all work carried on in California by the Geologic Division, U.S. Geological Survey.

It is a privilege for me to sign this report on behalf of the entire staff of our Division, each one of whom has contributed materially to the record it contains.

Respectfully submitted,

IAN CAMPBELL
State Mineralogist and
Chief, Division of Mines

Ferry Building, San Francisco
February 24, 1961

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ABSTRACT

A review of 1959-60 provides a record of another year of substantial accomplishment by the Division of Mines. Its publications were eagerly sought—in some instances in lots of several hundreds of copies of individual items—by both private and public organizations. Three new sheets (Santa Cruz, San Luis Obispo and Santa Maria) of the Olaf P. Jenkins edition of the State Geologic Map were issued, and two others (Ukiah and Westwood) were nearing completion. Special Reports dealing with such a range of subjects as limestone resources, mineralogy of beach sands, and tunnel petrology, as well as a number of regional geological investigations, were published.

The reference library, mineral exhibits, information desk and school programs continued to be under heavy public demand.

An augmented Division research program was overcoming early handicaps imposed by housing problems and personnel procurement. Initial investigations were directed toward trace element studies of California chrome and manganese ores.

The year witnessed the birth of a new—indeed unique—"mineral" industry for California and for the United States, in the practical harnessing of geothermal power in Lake County. Significant studies were made in the establishment of an asbestos industry at several points in the State. Both of these developments were aided by information services of the Division.

The cooperative program with the Mineral Deposits Branch, U. S. Geological Survey, continued with important additions to maps and information on mineral deposits in areas of northwestern California, the Sierra Nevada and the Mojave Desert. The year saw the inception of a cooperative research program with the U. S. Bureau of Mines, currently devoted to three investigations: electrowinning of tungsten from scheelite ores, slope and rock stability studies in open pits, and utilization of anorthosite.

I. INTRODUCTION

In presenting this, the Annual Report of the Division of Mines, for the 111th Fiscal Year (1959-60), it will be noted that it constitutes a part of a more comprehensive volume, entitled "Fifty-seventh Report of the State Mineralogist". To clarify these matters for librarians, bibliographers and our users generally, it should be explained that the "111th Fiscal Year" is measured from the beginning of California's statehood (1850), while the reports of the State Mineralogist are measured in numerical sequence from the first such report, issued in 1882. (These reports have not always been issued on an annual basis; for a considerable period they were on a biennial basis). Because the preceding report appears to have been well received, the present report follows closely the pattern set last year. This will have the advantage, moreover, of providing for ready comparison from one year to the next.

Characteristically, and desirably, the "Report of the State Mineralogist" has included material additional to the Annual Report of the Division of Mines. In this year's volume, for example, there will be found a "Summary of work in California by the Geologic Division, U. S. Geological Survey"; a statistical report on California mineral commodities in 1959; and a directory of California's mineral producers, dealers, and laboratories, 1959.

These items are included in this volume to increase its usefulness to the seekers, the students, the owners, and the operators of California mines and mineral resources. Taking these together, the volume, although not attempting to be a complete handbook, does bring between one pair of covers and makes readily available much material pertinent to California's mineral industry. Constructive criticism of the arrangement and of the material, from thoughtful readers and users of this volume, will be welcomed by all members of the Division of Mines staff who jointly and severally have contributed to this presentation.

II. AIMS AND FUNCTIONS OF THE DIVISION OF MINES

A. The Division of Mines Enters the 1960s

The year 1960 is not only the beginning of a decade on the calendar; it is also the beginning of a decade for the Division of Mines, which (then as the State Bureau of Mines) was first established in 1880. Although it should not be the purpose of an annual report to dwell on "ancient history", nevertheless 80 years of hindsight does provide a lengthy yardstick with which to measure the past, and an advantageous base from which those who have need to do so may estimate the future. Such estimates are of particular importance in the mineral industry because, as is emphasized elsewhere in this report, minerals constitute "a wasting asset", and planning for future needs and future development is thereby rendered more difficult and also more necessary than for other business enterprises.

The accompanying table, a survey by decades of the past 80 years, presents the best figures obtainable. It will be recognized by all familiar with the problems of mineral statistics—and especially with the mineral statistics of decades long past—that most of these figures are at

best not much more than approximations, and at worst may be not much more than "educated guesstimates". Because for some mineral commodities data are so inadequate, the table makes no attempt to cover all minerals. Instead, data are presented only for a sufficient variety of minerals to illustrate some of the fluctuations, and some of the trends, in the mineral industry of our state. Presenting the figures for each year would bring these features into much sharper focus, but in the interest of space, the decadal pattern must suffice.

Generalizing from these data, three features deserve note. 1) The decline, both in terms of relative and of absolute importance, of gold. 2) The fluctuations (brought on by war, by stockpiling programs, by tariff changes, etc.) that characterize many of the metals, such as chromium, manganese, and tungsten. 3) The steady increase, particularly notable since World War II, in the amount and in the value of the industrial ("nonmetallic") minerals, such as limestone, sand and gravel, borates, and diatomite. If there is any justification, and we believe there is, in projecting a long-term trend for a decade, it is clear that the 1960s in California will be a period of increasing importance for the constructional and industrial specialty minerals; of decreasing importance of gold and of fluctuating production of most of the other metals which, dollar-wise, may not be greatly significant for the total economy, but which technically may be important for defense needs and in other ways.

It is in the light of these projections that the Division of Mines must make, and is indeed already making, its plans for the 1960s.

B. Organizational Position of the Division of Mines

Because the Division of Mines constitutes a part, and an integral part, of a much larger organization, the State Department of Natural Resources, it is well at the outset of this report to indicate, graphically, the position of the Division of Mines in the structure of California government. Whereas last year the Department was composed of seven divisions, legislative action has subsequently created an eighth division—the Division of Recreation.

Advisory to the Director, and guiding the Division in development of policy is the State Mining Board, consisting of 5 men, appointed by the Governor with approval from the Senate. Terms of Mining Board members are 4 years. Reappointments are permitted.

During fiscal 1959-60, the following public-spirited citizens served on the Mining Board.

Bert C. Austin *; Consulting Mining Engineer of San Francisco; Vice-President of the Best Mines Co., formerly President and General Manager of the Idaho-Maryland Mines Corporation.

Philip R. Bradley, Jr. (Chairman) Consulting Mining Engineer of Berkeley and Jamestown; associated with the Alaska-Juneau Mining Co. and many other mining enterprises.

William C. Browning; Consulting Mining Engineer of Los Angeles.

Lewis L. Huelsdonk (Secretary) of Downieville; Secretary-Treasurer and General Manager of the Best Mines Co.

Thomas H. Rodgers (appointed July 1959) of Ventura; Superintendent, Rincon District, Chanslor-Western Oil and Development Company.

Blair W. Stewart (until July 1959) of Los Angeles; President of the Desert Minerals Co., formerly Vice-President of Coronado Copper and Zinc Company.

* Deceased August 2, 1960.

A sampling of California's mineral production through eight decades

	Copper		Gold			Iron ore		
	Pounds	Value		Fine ounces	Value		Short tons	Value
Metals								
1882	826,695	$148,805	1879	949,438	$19,626,654	1879	0	0
1890	23,347	3,502	1890	595,486	12,309,793	1890	0	0
1900	29,515,512	4,748,242	1900	767,390	15,863,355	1900	0	0
1910	53,721,032	6,680,641	1910	953,734	19,715,440	1910	579	$900
1920	12,947,299	2,382,303	1920	692,297	14,311,043	1920	5,975	40,889
1930	26,534,752	3,449,522	1930	457,200	9,451,162	1930	100	700
1940	12,833,363	1,450,170	1940	1,455,671	50,948,485	1940	54,707	194,362
1950	1,292,000	268,736	1950	412,118	14,424,130	1950	931,218	***
1959	1,326,000	407,000	1959	146,141	5,115,000	1959	**2,703,990	***

**(Latest available figure).
***Not available.

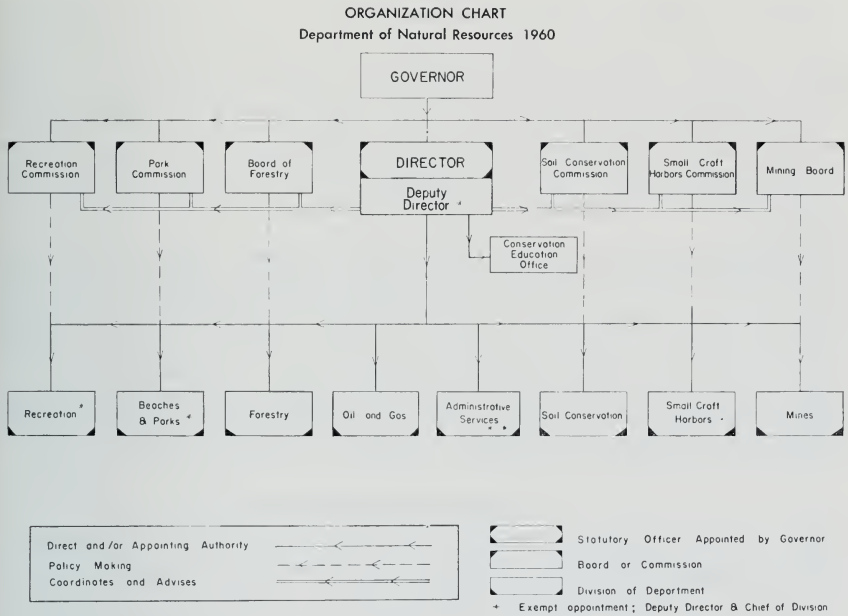
* Where data for a decennial year are unavailable, data for the closest year are presented.

	Lead		Mercury		Silver	
	Pounds	Value	Flasks	Value	Troy ounces	Value
Metals						
1880	4,200,000	$215,460	73,684	$2,194,674	882,169	$1,014,494
1890	800,000	36,000	22,926	1,203,615	820,336	861,353
1900	1,040,000	41,600	26,317	1,182,786	1,168,157	724,257
1910	3,016,902	134,082	17,665	799,002	1,840,085	993,646
1920	4,903,738	392,302	10,278	775,527	1,706,327	1,859,896
1930	3,542,796	176,241	11,374	1,255,257	1,622,803	624,779
1940	3,092,636	154,632	18,907	3,209,754	2,359,776	1,678,063
1950	31,662,000	4,274,370	3,850	313,000	1,071,917	970,139
1959	454,000	52,000	17,100	3,890,000	172,902	156,000

	Borates		Cement			Gypsum		
	Short tons	Value		Barrels	Value		Short tons	Value
Industrial Minerals (Non-metallic)								
1879	364	$65,443	1879	0	0	1879	0	0
1890	3,201	480,152	1891	5,000	$15,000	1890	3,000	$30,000
1900	25,837	1,013,251	1900	52,000	121,000	1900	2,522	10,088
1910	16,828	1,177,960	1910	5,453,193	7,485,715	1910	45,294	129,152
1920	127,065	2,794,206	1920	6,709,160	14,962,945	1920	20,507	92,535
1930	209,869	3,686,817	1930	9,831,938	14,575,731	1930	116,865	243,507
1940	212,358	5,254,154	1940	13,955,255	16,673,202	1940	314,843	599,944
1950	647,735	15,890,000	1950	26,685,004	66,258,675	1950	962,373	2,462,604
1959	1,900,000	46,150,000	1959	43,635,526	138,506,000	1959	1,686,000	3,788,000

	Salt (NaCl)		Talc	
	Short tons	Value	Short tons	Value
Industrial Minerals (Non-metallic)				
1879	9,000	?	0	0
1890	8,729	57,085	0	0
1900	89,338	204,754	0	0
1910	174,920	395,417	740	$7,260
1920	230,638	972,648	11,327	221,362
1930	347,945	1,167,487	15,861	154,258
1940	462,282	1,290,728	37,433	329,425
1950	868,496	3,816,655	109,747	2,069,211
1959	1,388,000	*	148,266	1,500,000

* Not available.



C. The Place of the Mineral Industry

Members of the "mining fraternity", mineral producers and mineral consumers are well aware of the vital place that the mineral industry occupies in today's economy. But the public in general needs at times to be reminded of the importance of the mineral industry. Along with agriculture, it is undoubtedly our most basic industry. Upon it depends not only much of the foundation, but virtually all of the existing

superstructure of what we regard as "modern civilization". Indeed "modern agriculture"—basic as it is—would not exist today without the heavy machinery, the tools, the chemicals, and the fertilizers that the mineral industry makes possible.

Basic as the mineral industry is, it might be presumed that it would long ago have become a well-established industry. That this is emphatically—even at times alarmingly—not the case, stems largely from two circumstances that beset the mineral industry, that are indeed unique problems of this industry:

(1) The mineral industry is constantly faced with the problem of "the wasting asset." Once a mine has been exhausted, there isn't any more ore to be had from this plot of ground. Minerals, once extracted, are not renewable, as are timber resources, or soils, or even people.

(2) The distribution of mineral deposits in the rocks of the earth's crust is in general rather erratic. Having mined out one deposit, it is rarely possible to move into the next section of land and find a similar deposit that will replace the one that has been exhausted.

D. The Role of the Division of Mines

It is in recognition of the basic importance of the mineral industry and the special problems that it faces, that both the Federal Government and the several states, long ago established agencies to assist the mineral industry by research, by mapping, by compiling of statistical information and in other ways. Currently in the Federal Government and in many of the states, the programs of these agencies are being accelerated in order to meet the public demands for more and for better information on, and understanding of, the mineral resources problems.

Happily this need for an accelerated program and for increased emphasis on research was recognized by the Legislature in its 1959 session, which authorized an augmentation for the Division of Mines budget which if carried forward over the ensuing five-year period would provide for modernization of the Division's laboratories and for additions to its staff in such specialized fields as geochemistry, geophysics and paleontology—greatly needed in order significantly to enhance the Division's research program.

III. THE YEAR'S ACCOMPLISHMENTS

The considerable and varied accomplishments of the Division of Mines in fiscal 1959-60 are presented in the following pages.

A. Publications

Publications, in any of the several media available to the Division, provide the one best way in which the Division can make known—in an impartial and uniform manner—the considered and tested results of the many and varied studies and investigations carried on by the technical staff. Listed below are the publications of the year.

Publications Issued During Fiscal Year 1959-60

MINERAL INFORMATION SERVICE

Vol. 12, No. 7, July 1959: Adobe brick; *Pajaroello;* Mining men appointed; Conferences highlight urban expansion.

Vol. 12, No. 8, August 1959: Geology along U.S. Highway 40, by Philip A. Lydon; Manganese program ending; Land withdrawal; Mining Board commends Fish & Game policy; Unusual asbestos ore in Fresno County; New book; Authorship.

Vol. 12, No. 9, September 1959: Mineral exhibit, by George L. Gary and Robert A. Matthews; Rodgers appointed to Mining Board; Fire danger; Los Angeles office quarters soon to be moved; Engineering geologists.

Vol. 12, No. 10, October 1959: Soda ash industry of Owens Lake, 1887-1959, by William E. Ver Planck; E. Collins honored; New program for Division; West Yellowstone earthquake; New map ready.

Vol. 12, No. 11, November 1959: California mineral production in 1958, by Henry H. Symons and Fenelon F. Davis; Old arrastres near Sierra Buttes, by Philip A. Lydon; New book on mineralogy; Anderson appointed Chief Geologist of U.S. Geological Survey; J. C. O'Brien retires; Mining in California stream beds; Duluth conference; Two new economic reports.

Vol. 12, No. 12, December 1959: Urbanization and the mineral industry, by Harold B. Goldman; Single-purpose withdrawals as a danger to national resource security, by Earl F. Cook; Death Valley withdrawals; Manganese discovery; OME moves; USGS enlarges Menlo office; Progress report to the State Mining Board, by Ian Campbell; Landslide map reviewed; New report on clay; Index to volume 12; New mines reports; Land reopened; Coming events, 1960.

Vol. 13, No. 1, January 1960: Geologic sketch of the southern Coast Ranges, by Gordon B. Oakeshott; Mineral marketing; New Mines program; AIME to hold 1960 Metals and Minerals meeting; A page from history; New books; San Fernando bulletin released; Santa Cruz map ready.

Vol. 13, No. 2, February 1960: Maps used in mineral investigations, by Bennie W. Troxel; California mining events, 1959, by Fenelon F. Davis and staff; Alleghany-Downieville maps.

Vol. 13, No. 3, March 1960: Geothermal power, by James R. McNitt; Division of Mines conducting shale survey; Henry Symons retires; Special Report on beach sands; Hydraulic mining history published; Withdrawn lands reopened; Report on 1957 S.F. earthquake now available; New references on California geology.

Vol. 13, No. 4, April 1960: Mining claims under Public Law 167, by Henry H. Symons; New report on limestone and dolomite; Commercial guano, by Edmund W. Kiessling; Coming events; Lake Elsinore quadrangle studied; Petroleum production in 1958 and 1959; Santa Maria map available; Report on volcanic domes near Jackson; Order form (automatic purchase plan).

Vol. 13, No. 5, May 1960: Expansible shale, by John L. Burnett; Age determination by the lead-alpha method; New references on California geology; Nevada City buildings to go; Coming events; Legal guide out of print.

Vol. 13, No. 6, June 1960: Skin diving for gold in California, by William B. Clark.

Bulletins

Bulletin 146, Geology of Lake Elsinore quadrangle, California, by Rene Engel; Mineral deposits of Lake Elsinore quadrangle, California, by Rene Engel, Thomas E. Gay, Jr., and B. L. Rogers.

Bulletin 172, Geology of San Fernando quadrangle, California, by Gordon B. Oakeshott.

Special Reports

Special Report 55, Franciscan chert in California concrete aggregate, by Harold B. Goldman.

Special Report 56, Geology and economic possibilities of the limestone and dolomite deposits of the northern Gabilan Range, California, by Oliver E. Bowen, Jr. and Cliffton H. Gray Jr.

Special Report 57, San Francisco earthquakes of March 1957, Gordon B. Oakeshott, editor.

Special Report 58, Geology of limestone and dolomite deposits in the southern half of the Standard quadrangle, Tuolumne County, California, by Earl W. Hart.

Special Report 59, Mineralogy of beach sands between Halfmoon and Monterey Bays, California, by C. Osborne Hutton.

Special Report 60, Tertiary volcanic domes near Jackson, California, by Robert L. Rose.

Geologic Map of California, Olaf P. Jenkins Edition

San Luis Obispo, Santa Cruz, and Santa Maria sheets, compiled under the direction of Charles W. Jennings.

Miscellaneous

Available publications, California Division of Mines, March 1960, compiled by Mary H. Rice and Elisabeth L. Egenhoff.

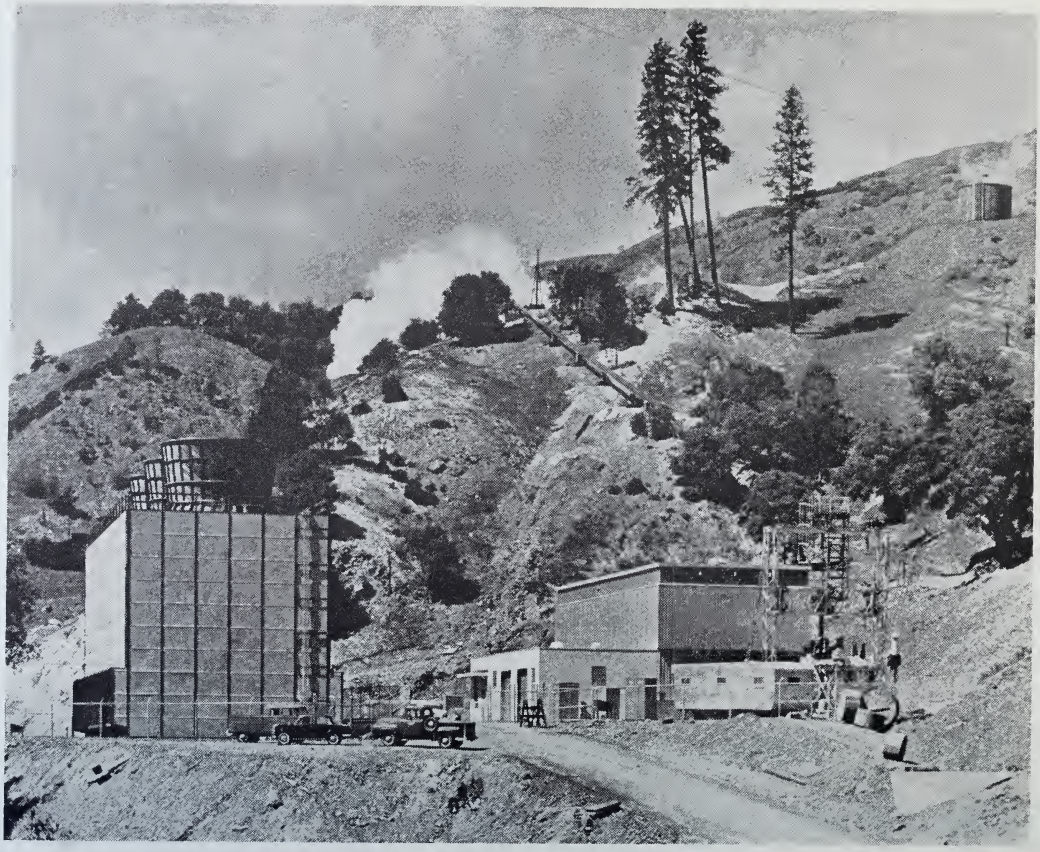


PHOTO 1. The Geysers Power Plant. Taken July 1960, courtesy *Pacific Gas and Electric Company*.

Reprint

Bulletin 141, Geologic guidebook along Highway 49—Sierran gold belt—the Mother Lode country, prepared under the direction of Olaf P. Jenkins.

Publications in Press at End of Fiscal Year 1959-60

Mineral Information Service

Vol. 13, No. 7, July 1960: Fossils: What they mean and how to collect them, by L. R. and R. B. Saul; Recovery of alumina from anorthosite; New mining law; Locating guano deposits—a correction; New U.S.G.S. publication.

Vol. 13, No. 8, August 1960: The geologic map, by Quintin A. Aune; Sacramento office moves; Interpretation of contour lines; Surface rights determination; Withdrawals and reservations of public lands and resources; Public land survey corners; Mineral marketing; State Mineralogist's annual report now available; Solving the materials problem by substitution, by John J. Schanz Jr.

Bulletins

Bulletin 179, Geologic reconnaissance of the northern Coast Ranges and Klamath Mountains, California, with a summary of the mineral resources, by William P. Irwin.

Special Reports

Special Report 61, Geological section and petrography along the Poe Tunnel, Butte County, California, by Philip A. Lydon.

Special Report 62, Geology of the Otay bentonite deposit, San Diego County, California, by George B. Cleveland.

Special Report 63, Geology and paleontology of the southwest quarter of the Big Bend quadrangle, Shasta County, California, by Albert F. Sanborn.

Special Report 64, Geology of the Orchard Peak area, California, by Owen T. Marsh.

Special Report 65, Petrology and structure of the San Bernardino Mountains north of Big Bear Lake, California, by James F. Richmond.

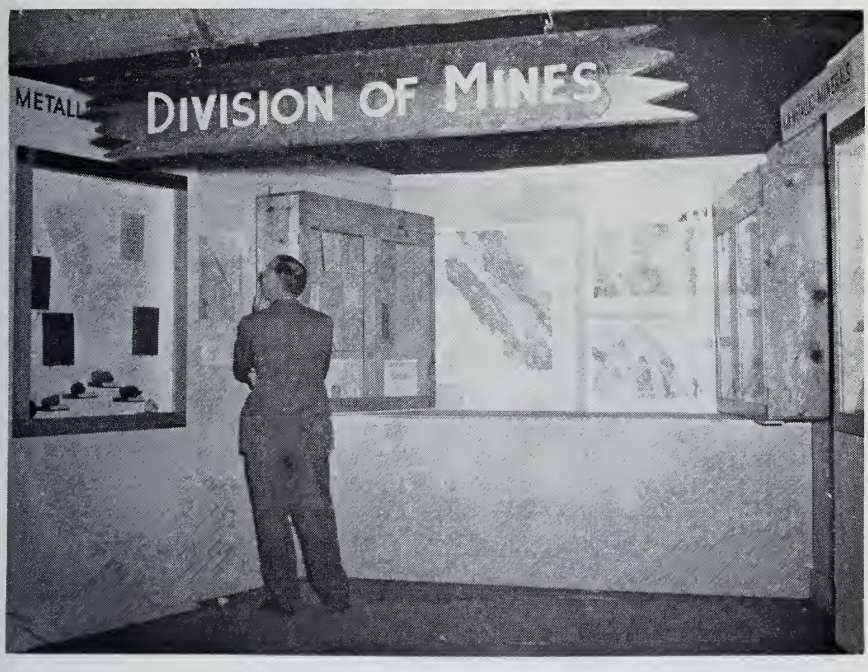


PHOTO 2. Division of Mines exhibit at the 1959 California State Fair and Exposition.

Report of the State Mineralogist

Fifty-sixth report of the State Mineralogist, containing: Annual report of the State Mineralogist, Chief, Division of Mines, for the 110th fiscal year, by Ian Campbell and staff; Summary of work in California by the Geologic Division, U.S. Geological Survey, by Charles A. Anderson; California mineral commodities in 1958, by Henry H. Symons and Fenelon F. Davis; Directory of California mineral producers, dealers, and laboratories, 1959, by Henry H. Symons and Fenelon F. Davis; Metal, mineral, and mineral fuel review for 1958, by Charles W. Merrill and others.

Geologic Map of California, Olaf P. Jenkins Edition

Ukiah and Westwood sheets, compiled under the direction of Charles W. Jennings.

Reprints

Bulletin 158, Evolution of the California landscape, by N. E. A. Hinds.

Bulletin 170, Geology of southern California, Richard H. Jahns, editor.

Legal guide for California prospectors and miners, revised edition, 1960, by Charles L. Gilmore.

B. New State Geologic Map *

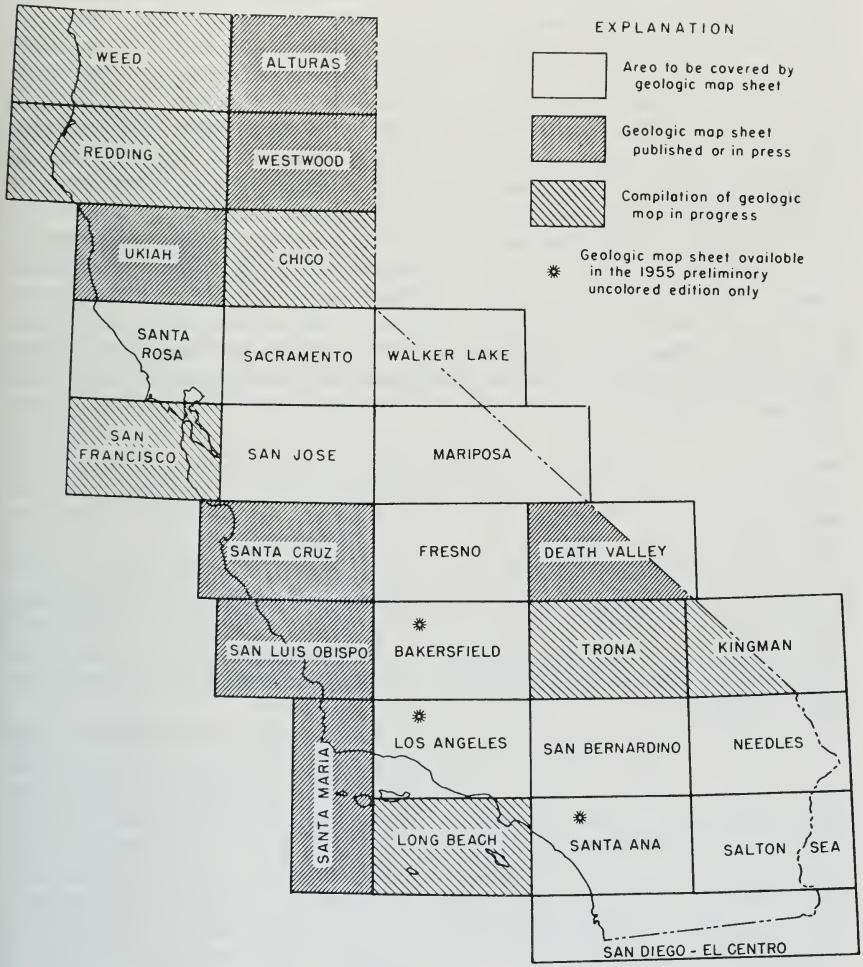
During the past fiscal year (1959-60), three more state map sheets were published (San Luis Obispo, Santa Cruz, and Santa Maria), bringing to five the number of sheets now available in the new colored edition of the State Geologic Map. Two additional sheets, Ukiah and Westwood, were completed and sent to press as the fiscal year came to a close. The accompanying index map shows the status of the various map sheets as of June 30, 1960, and indicates the areas to be covered by the 27 sheets which will comprise the new State Geologic Map. Seven sheets (Kingman, Redding, Weed, San Francisco, Long Beach, Trona, and Chico) were in various stages of compilation on advance prints of the revised Army Map Service topographic base maps. The finished base map for the Kingman sheet was received near the end of the fiscal year, and should be the next sheet to go to the printer.

Commencing with the Ukiah and Westwood sheets, a limited number of each map sheet will be printed in an uncolored edition. Such uncolored maps will satisfy the needs of geologists desiring regional geologic base maps suitable for black and white reproduction or for special projects wherein the objective is to focus attention on particular map units.

The organization of the stratigraphic nomenclature charts which will accompany each of the remaining map sheets has been modified in an attempt to present the essential details of local stratigraphy in a more easily understandable form. Brief descriptions of the lithologic character of the various formational units have been introduced on the modified charts. Some minor modifications of the map legend and fault representation have also been introduced in order to make future maps more informative. To insure a reasonable degree of conformity from one map sheet to another, a list of standard procedures has been prepared to aid the various members of the staff engaged in the preparation of the State Geologic Map.

Requests for a binder in which to accumulate and preserve the map sheets, led to an investigation of possibilities. The results have indicated that such an item could not be made available at a reasonable cost and the matter has accordingly been dropped.

* A history of the inception and development of the important State Geologic Map program is given in the 55th Report of the State Mineralogist, pp. 50-57. Additional information is presented in the 56th Report, pp. 17-24.



PLAN AND PROGRESS OF THE NEW GEOLOGIC MAP OF CALIFORNIA
1959-60 FISCAL YEAR

FIGURE 2.

The Division during the year received authorization to purchase photo-copy equipment suitable for map reproduction, thus making it possible to obtain accurate copies of unpublished and out-of-print maps. This will considerably enhance the map compilation program, and will also provide for development of more complete map reference files.

The reconnaissance geologic mapping program, recently inaugurated by the Division, continued at a rapid pace, providing basic geologic mapping of several areas of the state aimed toward obtaining adequate information for the 1:250,000 scale State Geologic Map. The regional information thus obtained has at the same time thrown light upon the geologic details of many specific localities and promises to provide a foundation for a score of more intensive geological investigations.

Approximately 5,000 square miles were mapped, using reconnaissance methods, to obtain needed information for the Westwood sheet. A large part of the Trona-sheet area and a 30′ portion of the Chico-sheet area were also mapped by Division personnel during the year. In preparing the Ukiah, Redding, and Weed sheets several "key" areas were visited in order to resolve conflicting map information, or to add significant details to the compilation. Interpretation of aerial photographs of the Homer Mountain and Dead Mountains area on the Kingman sheet was undertaken to supplement reconnaissance mapping performed in that area three years ago. Reconnaissance mapping for the eastern part of the Walker Lake sheet (in the Mono Lake area) was also completed.

A new project of reconnaissance mapping in the southern Sierra Nevada was undertaken, and a considerable amount of this mapping was completed during the fiscal year. Indeed, by the end of the fiscal year, mapping had been completed for the major part of four 15′ quadrangles, and initial preparations had been made for mapping nine more 15′ areas.

In addition to the new mapping accomplished by the Division, significant new (unpublished) data for use on the State Geologic Map were received from numerous companies, individuals, and state and federal agencies. These include: several petroleum companies, Utah Construction and Mining Company, Southern Pacific Company, U. S. Geological Survey, U. S. Bureau of Reclamation, California Department of Water Resources, Stanford University, University of California, University of California at Los Angeles, University of Southern California, State and Federal Soil Surveys, Tom Dibblee, Jr., Alan Galloway, Luis Kemnitzer, Vernon McMath, and Parry Reiche. To all these, the Division is greatly indebted.

The public's interest in the State Geologic Map is indicated by the sale of over 8,000 copies of the available map sheets since January 1959 when the first sheet of this set was released. Public interest is also indicated by the 1200 individuals and companies who have subscribed to the Automatic Purchase Plan, a plan whereby it is possible to maintain a standing order for any or all of the map sheets as they become available.

During the course of the year, numerous letters requesting map information on California geology were answered, and a considerable number of visitors came to the map room for personal consultation.

Among such were geologists from the following agencies and companies: U. S. Geological Survey (Geophysics, Mineral Deposits and Ground Water Branches), Atomic Energy Commission, California Department of Water Resources, U. S. Army Corps of Engineers, Stanford Research Institute, several private consulting firms, State and Federal Soil Surveys, University of California and Stanford University (both graduate students and professors), Southern Pacific Company, Utah Construction and Mining Company, Bechtel Corporation, Asbestos Corporation of America and Johns-Manville Corporation, and several petroleum companies. Many of the requests were for portions of the State Geologic Map Series to be used in various special investigations such as: aerial geophysical studies (magnetic and radiometric), engineering studies (canal, tunnel, and metropolitan rapid transit routes), and construction material surveys.

Out-of-state and foreign geologists who visited the map room for information on methods used in preparing the State Geologic Map, included representatives from the Kansas, Illinois, Oregon, New York and Virginia State Geological Surveys, the Egyptian and Turkish Geological Surveys and the Geophysical Laboratory of Washington, D. C.

C. County Reports

County reports are the end products of one of the major functional activities of the Division of Mines. A county report presents the results of a mineral inventory survey, summarizing all pertinent information on a county's mineral resources. The report includes information on ownership of individual deposits, nature of the deposits and their relationship to local and regional geologic features, history of the mining operations, and current status. Photographs, charts, mine maps, planimetric maps of the county showing location of mineral deposits, and geologic maps on a scale more detailed than is possible in the state map assist in the presentation of the facts.

The accompanying table indicates the current availability of County Reports. Dates refer to the report's publication in the California Journal of Mines and Geology and Reports of the State Mineralogist. With discontinuance of the Journal, on completion of the 1958 volume, future County Reports will be issued in a new series, probably to be designated "County Reports of the Division of Mines". Several County Report manuscripts are being processed, and the first of these reports, it is hoped, will appear in 1961-62.

Time studies have shown that, if the current pattern were to be followed, a disproportionately large share of the Division's effort would have to be devoted exclusively to County Report work, in order to bring reports on all counties of the State into even a near current status. Consequently it is proposed in the future to condense and to streamline the County Reports. The best methods of achieving these ends are now under study by a Division Committee.

Availability of county reports. (Published in the California Journal of Mines and Geology.)

Alameda	April 1950[a]	Orange	January 1925[a]
Alpine	October 1931*	Placer	July 1927-1936[a]
Amador	January 1954 reprint	Plumas	April 1937[b]
Butte	July 1949	Riverside	July 1945[a]
Calaveras	July 1936[c]	Sacramento	April 1955
Colusa	July 1929	San Benito	January 1947
Contra Costa	October 1958	San Bernardino	January-April 1953
Del Norte	October 1952	San Diego	January 1939[c]
El Dorado	October 1956 reprint	San Francisco	April 1929[b]
Fresno	July 1951	San Joaquin	January 1955
Glenn	January 1952[b]	San Luis Obispo	October 1935[b]
Humboldt	October 1941	San Mateo	October 1955 reprint
Imperial	April 1942[a]	Santa Barbara	October 1925[b]
Inyo	January 1951	Santa Clara	April 1954 reprint
Kern	April 1949[c]	Santa Cruz	January 1943
Kings	July 1953	Shasta	April 1939**
Lake	January 1947	Sierra	January 1942
Lassen	October 1936	Siskiyou	October 1947
Los Angeles	July-October 1954	Solano	April 1927
Madera	October 1950	Sonoma	January 1950
Marin	July 1955	Stanislaus	April 1947
Mariposa	January-April 1957	Sutter	1920[a]
Mendocino	October 1953	Tehama	July 1946[b]
Merced	July 1952	Trinity	January 1941[c]
Modoc	October 1936*	Tulare	July 1958
Mono	April 1940	Tuolumne	January 1949
Monterey	January 1925[a]	Ventura	July-October 1932[b]
Napa	April 1948	Yolo	July 1950
Nevada	July 1941	Yuba	April 1952[b]

* Report available but new report assigned and work in progress.
** Report available but new report completed for early publication.
Out of print publications:
[a] New reports assigned and in progress.
[b] No assignment.
[c] New report completed for early publication.

D. Mineral Commodity Investigations

Although as recently as three years ago, with the publication in December 1957 of Bulletin 176, Mineral Commodities of California, the Division had brought up to date existing knowledge of some 76 mineral commodities, the needs of the California economy for new mineral materials and for new sources of minerals require that the Division again give intensified effort to providing new and revised information on many California mineral commodities and mineral commodity potentials.

Those commodities that are under active investigation are listed below, together with a summary statement indicating current status of the study.

Asbestos. Work is under way which will lead to a statewide report on asbestos in California.

Barite. A statewide survey of barite is in its initial stages.

Clay. Field work was completed on a study of the clay deposits of the Little Antelope Valley area in Mono County; a first draft of a manuscript and map was submitted and a second draft is in preparation. Galley and page proof of a manuscript on the Otay bentonite deposit of San Diego County have been corrected and early publication is anticipated. Field investigations have been initiated in two important areas: the Cooperstown area, including the Ione formation, in Stanislaus County; and the Hart Mountain area in San Bernardino County.

Chromite. Geologic mapping of the Butler Estate chrome mine was completed and a report on this very interesting property (additionally interesting because of the occurrence of asbestos) was in preparation.

Diatomite. Field work on the diatomite deposits of the Long Valley area, Mono County, was completed and a report in manuscript form has been submitted.

Expansible Shale. The construction industries and the raw materials they utilize have been of special interest to the Division of Mines owing to their importance in the total value of mineral production throughout California. Expansible shale is one of the generally unknown but extremely promising raw materials of these industries. It is used in the manufacture of a lightweight aggregate for concrete; the reduced weight of the aggregate lowers the cost of labor and materials in many types of concrete structures.

During the fiscal year, the Division of Mines continued its evaluation of the expansible shale resources of California. Although the study is statewide in scope, detailed examinations are being restricted to those areas which currently have the greatest economic potential for lightweight aggregate. Santa Clara County has been selected for the first detailed study. This area is especially desirable for location of an expanding plant because of the extensive residential and industrial construction that has centered around San Jose. Following publication of the preliminary results of this study by John L. Burnett, in *Mineral Information Service,* the Division of Mines received many requests for additional information from companies and consulting firms.

Work to date in the San Jose area has consisted of detailed sampling and laboratory investigation of the shale deposits east of San Jose, Morgan Hill and Gilroy. Further investigations will involve the location of potential shale deposits, the physical-chemical factors that effect expansion and the economic-geographical problems that obtain in establishing an expansible shale operation.

Geothermal Power. Although not a mineral commodity in the usual sense, there is some justification for considering at least a portion of the hot water and steam that are the source of the power, as a mineral resource. To this extent a new mineral industry—new in the United States, that is—was born in California this year, with the initial generation of electric power from natural thermal sources in the vicinity of The Geysers, in Sonoma County. Geologic mapping and structural interpretations made by Division of Mines staff have been of assistance in the development of this and in the testing of other areas within the State. And a timely article on "Geothermal Power" by James McNitt appeared in the March 1960 issue of *Mineral Information Service.*

Gold. A report which discussed an interesting application of what is regarded as one of the newest sports and recreations to the field of mining was published in the June 1960 issue of *Mineral Information Service:* "Skin Diving for Gold in California", by William B. Clark. A timely revision of the Division's bulletin on placer gold is underway.

Lead and Zinc. The mine area and the underground workings of the Queen of Sheba-Carbonate mine, Inyo County, were mapped and a first draft manuscript report completed.

Limestone and Dolomite. Work was intensified on these commodities during the year, chiefly on a district basis. Special Report 56 on the Limestone and Dolomite Deposits of the Northern Gabilan Range, by O. E. Bowen, Jr., and C. H. Gray, Jr., and Special Report 58 on the Limestone and Dolomite Deposits of Standard Quadrangle, Tuolumne County, by Earl W. Hart, were released and distributed. Field work was largely completed and reports were in progress on the Dos Cabezas district of San Diego County, the Victorville-Oro Grande district of San Bernardino County, and the Omo Ranch district of El Dorado County. Preliminary field reports were filed on numerous deposits in Riverside, Shasta, and San Bernardino Counties. Requests for information on limestone and dolomite deposits continued at a high level.

Jade. A report by C. W. Chesterman describing the metamorphic effects, including the formation of jade, of the intrusions of ultrabasic rocks upon graywackes at Leach Lake Mountain, Mendocino County, was accepted for presentation at the technical sessions of the XXI International Geological Congress, to be held at Copenhagen, Denmark, in August 1960.

Manganese. Mapping of a tephroite-bearing deposit near Randsburg, Kern County, was completed and a report has been finished.

Obsidian. A report describing the occurrences and uses of obsidian is in preparation.

Perlite. Basic geological work has been completed on the perlite resources of California and a final report is in preparation.

Rare Earths. Illustrations were prepared and a first draft of a manuscript was completed for a report on the rare earth deposits of Music Valley, Riverside County.

Sand and Gravel. The systematic general inventory of the sand and gravel resources of the state, started last year, was continued. Data on deposits in the northern one-third of the state are being prepared for publication as Part A—Northern California, the first of a 3-part statewide bulletin. Included are a map showing the location of the deposits and the fixed commercial plants, and a text containing data on the geologic occurrence, plant descriptions, and test results. Field work is continuing on Part B—Central California.

The detailed sand and gravel investigations of individual drainage-basins are integrated into the statewide inventory program wherever possible. A report on the sand and gravel resources of the Kern River near Bakersfield is in press, while field work continues on the sand and gravel deposits along the San Joaquin River. These studies will accelerate the preparation of Part B of the statewide inventory in central California.

Special Report 55, Franciscan chert in California concrete aggregate, by Harold B. Goldman, was published during the year. It presented information which is of assistance to the sand and gravel industry by calling attention to those deposits which may contain inferior materials.

The December 1959 issue of *Mineral Information Service* carried an article on "Urbanization and the Mineral Industry" by Harold B. Goldman. This issue has been widely sought both by industry representatives and planning officials for both groups are alert to and share concern over the conflicts in land use caused by urban expansion, and recognize the inevitable increase in costs to the home builders when sand and gravel producers are forced to move to locations more distant from urban centers.

Silica. A geologic map, scale 1 inch equals 100 feet, was completed of a deposit of the Eureka quartzite near Lone Pine, Inyo County, and the study of thin sections of the quartzite and associated rocks is in progress. As described in another section of this report, the mapping of the quartzite-bearing Oro Grande series near Victorville, San Bernardino County, was completed.

Soda Ash. An article on the history of the natural soda ash industry at Owens Lake, by William E. Ver Planck, was featured in the October 1959 issue of *Mineral Information Service.*

Talc. As part of the investigation of talc deposits of Death Valley region, geologic maps of talc-bearing areas in Warm Spring Canyon and Galena Canyon in the Panamint Range, and others in the central part of the Ibex Hills, the Sheep Creek area of the Avawatz Mountains, and the Beck Spring area in the Kingston Range were completed. About 20 deposits were visited. The resulting manuscript is nearing completion. L. A. Wright, the Division's talc specialist, was co-author of "Talc and Soapstone", a definitive article constituting one of the chapters of the well-known handbook "Industrial Minerals and Rocks" (3rd edition) published by the American Institute of Mining and Metallurgical Engineers.

E. Miscellaneous Mapping Projects

In addition to the 1:250,000 scale new state geologic map program which has claimed much effort on the part of the staff, a number of other mapping projects are under way. Some of these projects represent the initial phase of a mineral commodity study, or will eventually appear as contributions to a County Report. Others do not fall into any specific category and so are best grouped under the heading of "miscellaneous." Such projects may be undertaken in order to gain information on a hitherto unmapped area or because they will contribute basic scientific information; others are initiated for some very specialized purpose.

A summary of such currently active mapping projects follows:

Avawatz Pass quadrangle. Field mapping of the northeast quarter of this quadrangle in San Bernardino County is under way.

Bodie quadrangle. Geological mapping in the Bodie quadrangle in Mono County was started in the fall of 1958 and is being continued. In October 1959, reconnaissance geological mapping was done in the area to the north and east of Mono Lake for the eastern part of California's portion of the Walker Lake sheet of the State Geologic Map.

and also to give field geologists on the project opportunity to determine the broad regional setting of the Bodie area. The Bodie, French Canyon, Huntoon Valley, and the Aurora quadrangles were mapped. This reconnaissance mapping was completed and during the course of the investigation, outcrops of lacustrine sediments containing fossil snails, tentatively identified as upper Pliocene, were discovered along the south-eastern shore-line of ancestral Mono Lake. This discovery makes possible accurate dating of the associated volcanic rocks.

Corona South quadrangle. A manuscript on the geology of the quadrangle, in Riverside County, has been completed and is being processed for publication.

Dublin Hills area. Basic geological mapping of the Dublin Hills area ($NE\frac{1}{4}$ of the Shoshone 15-minute quadrangle) in eastern Inyo County was completed and a final map compiled. The area contains valuable deposits of perlite, pumicite, clay, and quartzite. Pumicite has been mined in considerable quantity near Shoshone, but current mining activity now centers at a clay deposit in the southern part of the area.

Haiwee Reservoir quadrangle. Field work in the northwestern quarter of the Haiwee Reservoir quadrangle in Inyo County was 75 percent complete. This area is being mapped with special emphasis on the uranium mineralization and the Coso formation. A new vertebrate fossil locality was found which has yielded several good specimens. These occur in the upper part of the Coso formation and will be helpful in assigning a geologic age to the formation. The field mapping is being extended into the northeastern quarter of the Haiwee Reservoir quadrangle and into the south half of the Keeler quadrangle.

Kelseyville Southeast quadrangle. Mapping of this quadrangle, located in northern Sonoma County, was completed during the 1959 field season and a report is nearly ready for submission. The quadrangle includes the western half of the Mayacmas quicksilver district and "The Geysers", a fumarole area which is now being utilized as a source of steam to produce 12,500 kw of electric power. The purpose of this project was to investigate the geologic factors controlling the occurrence of mercury and natural steam, and to determine if the two commodities have a genetic relationship.

It was concluded that the deposition of mercury, as well as the occurrence of natural steam, are probably related to Pleistocene volcanism and contemporaneous right-lateral faulting. The mercury-bearing hydrothermal fluid was channelled along fissures which developed at deflections on the right-lateral faults. Because the mercury is believed to have travelled in the gas phase, deposition of cinnabar or native mercury was dependent upon the temperature and the relative partial pressures of Hg and S_2 in the gas. The fumaroles which are located in the same fault zone as the mercury deposits, are thought to represent the final stage of the above process.

The results of this investigation should aid in estimating the mercury and natural steam potential of other California areas where these commodities have not been developed and utilized as extensively as in the Kelseyville quadrangle.

Matterhorn Peak quadrangle. Mapping of this quadrangle, which lies astride the backbone of the Sierra Nevada in Mono and Tuolumne Counties, has been completed and a report is in preparation. The geological map will utilize a new topographic base published by the U. S. Geological Survey in 1959.

Mescal Range quadrangle. Field mapping of this area in San Bernardino County has been completed, and a report is in preparation.

Monterey-Salinas area. Field mapping of the Monterey, Seaside, Spreckels, Salinas, and Marina 7½-minute quadrangles in Monterey County has been completed except for the south half of the Spreckels sheet and the Carmel vicinity of the Monterey sheet. Much new information has been gathered on the structure and geologic history of the northern end of the Santa Lucia Range. Petroleum possibilities, dimension stone, and specialty sands are the principal features of economic importance.

Ord Mountains. Geologic mapping of a portion of the Ord Mountains in San Bernardino County has been completed and a manuscript report has been submitted.

Palos Verdes Hills. A geologic map of the Palos Verdes Hills of Los Angeles County is in preparation. This project has been planned to supplement mapping already done by R. H. Jahns of the California Institute of Technology. It is aimed at presenting both surficial and bed-rock geology so the map can be used in the proper location of buildings and other engineering applications as well as in delineating the mineral resources of the area.

Shadow Mountains quadrangle. Geologic mapping of this quadrangle in San Bernardino County was completed.

Shoshone quadrangle. Geologic mapping of the southwest quarter of the Shoshone quadrangle in Inyo County, is continuing.

Victorville area. Field work was completed and report preparation was initiated on the stratigraphy, structure, and economic geology of the Oro Grande series near Victorville. Extensive deposits of high-grade limestone and quartzite occurring in the complexly folded and faulted Oro Grande series (Upper Paleozoic (?)) were mapped on a scale of 1: 10,000 and their economic potential was evaluated. Results of chemical analyses on more than 50 rock samples were assembled to support the evaluation.

Yosemite-Mariposa area. Mapping of the Bear Valley and Feliciana Mountain 7½-minute quadrangles was largely completed as well as nearly half of the Kinsley 7½-minute sheet. Work is continuing on the Buckhorn Peak, Buckingham, and El Portal 7½-minute quadrangles. New evidence of the Jurassic age of a sequence of beds along the Merced River formerly believed to be Paleozoic has been assembled.

F. Mineral Research

The augmented research program, authorized by action of the 1959 Legislature, got under way during the year. Housing problems—principally involving the Port Authority's future plans for the Ferry Building, where the Division has been quartered for over 60 years—have made it impossible to put the research program into full operation. Space must be obtained and designed for the various specialized

instruments so necessary in a modern minerals research program. Happily, by the close of the year, it appeared that the housing problem would be resolved and the Division therefore looks forward to a considerably augmented research program in the coming year.

Meantime, a number of research investigations have been gotten under way with existing facilities.

A trace element study has been started on manganese and chrome samples from California, with particular emphasis on the nickel and cobalt content. A total of 397 spectrograph samples of manganese and chrome ore and country rocks associated with the ore specimens was run on the Division of Mines' 1.5 meter emission spectrograph (Applied Research Laboratories, 1935 model) and approximately 50 more samples will be run by the end of the 1959-60 fiscal year.

Of the 397 spectrograph samples run, 332 pertain to the manganese study of which 156 were samples of manganese minerals and 176 were samples of country rock and minerals associated with the manganese minerals. The other 65 samples pertained to the chrome study, 26 of which were chromite samples of country rock, mainly serpentinite and peridotite.

Conclusion

The nickel and cobalt content of manganese minerals are greater statistically in deposits derived from primary sedimentary manganese carbonates and hydrous manganese silicates than in those manganese oxides derived from metamorphosed manganese deposits.

Manganese samples were from the following counties: Alameda, Humboldt, Mendocino, Plumas, San Joaquin, San Luis Obispo, Shasta, Siskiyou, Sonoma, Tehama, Trinity, and Tulare.

The chrome samples were from the following counties: Humboldt, Napa, Plumas, San Luis Obispo, Siskiyou, Tehama, Tulare, and Butte.

The accompanying charts show that chromite and serpentine, including peridotite, contain substantial amounts of nickel and cobalt. Other rocks associated with chromite, such as gabbros, carbonates, and tremolite rock, contain much smaller amounts of nickel and cobalt.

A comparison of this chart with the chart for manganese ores indicates that chromite is likely to contain more nickel and cobalt than the manganese ores.

Another research project involved identification of the minerals associated with the tephroite collected at the Big Indian manganese prospect in eastern Kern County.

Heavy mineral studies made extensive use of the Frantz Isodynamic Separator, sieves, and heavy separation liquids. A report on tephroite in California manganese deposits is scheduled for publication in *Economic Geology*.

Staining techniques were perfected in the laboratory to aid staff geologists in the visual identification of potash feldspars and the soda-lime feldspars in hand specimens of various kinds of rocks.

Field work on deposits of ludwigite in eastern Fresno County was concluded and a report describing the occurrence is in preparation. Laboratory petrographic studies will benefit from a chemical analysis of the ludwigite prepared by the Petrology and Geochemistry section of the U. S. Geological Survey. A report dealing with fluoborite in

Chrome ores.

	Nickel (Percent)			Cobalt (Percent)			Number of samples
	n.d.	<0.1	>0.1	n.d.	<0.01	>0.01	
Chromite	0	8	92	0	11	89	26
Serpentine	3	27	70	10	57	33	30
Other rocks	45	33	22	56	33	11	9

n.d. = not detected.

Manganese ores.

	Nickel (Percent)			Cobalt (Percent)			Number of samples
	n.d.	<0.1	>0.1	n.d.	<0.01	>0.01	
Mn oxide,							
from primary silicate	4	62	34	29	58	13	52
from primary carbonate	0	35	65	11	54	35	26
from both	6	34	60	13	53	34	47
Total Oxide	4	46	50	19	55	26	125
Rhodochrosite, veins	18	82	0	64	18	18	11
Rhodonite	0	75	25	0	88	12	8
Neotocite	0	43	57	0	57	43	7
Miscellaneous	0	60	40	0	100	0	5
Total Mn mineral	5	50	45	20	56	24	156

n.d. = not detected.

the Bristol Mountains, San Bernardino County, California, was completed. A new occurrence of vonsenite was found in the Gabilan Mountains, eastern Monterey County. The field relationships of this rare iron-magnesium borate make it possible to determine its paragenesis which is being further investigated in the laboratory.

G. Public Services

Information Offices

With the filling of the General Services Administration quota for the purchase of domestic manganese ore in August 1959, a decade of particular interest to the California mining public was completed. These years, 1951-1959, witnessed a period of good demand for the mining and sale of strategic minerals through the various U. S. Government stockpiling programs. Following the termination of the manganese ore purchase program, a noticeable decline in public inquiries regarding metals was apparent.

Nevertheless the Information Sections in the Division offices at San Francisco, Los Angeles, Sacramento, and Redding, continued to receive numerous inquiries over the counter and by mail and by telephone, on topics of importance to the mining public. The questions can generally be grouped in one of the following classifications, namely: raw materials, geology of California, mining and mineral processing, physical and chemical data on minerals and rocks, mineral utilization and marketing. Some samples of specific information supplied to the mining public have been extracted from the monthly reports of staff members and are presented below.

Supplied mineral consultant with information on swelling clay problems with respect to handling clay by pipeline.

Assisted insurance company engineer in locating earthquake zones and in interpreting earthquake probability factors.

Provided information that resulted in leasing of a limestone property to new operator.

Discussed with property owner the economics of quarrying and marketing stone himself, versus selling unquarried rock to contractors for use as dimension stone.

Assisted highway engineer in planning freeway route by providing a discussion of slope stability and petrology of rock outcrops.

Discussed mineralogy of sands for proposed use as a heat dissipator around underground high-voltage lines.

Explained to an architect the usefulness of geologic reports in determining foundation conditions.

Supplied information on suitable limestone deposits to a company interested in mining and processing white limestone for use as a paint extender, filler, and whiting.

Supplied mineral producer with information on freight rates.

Discussed stratigraphic nomenclature problems with a company geologist.

Discussed character of brick clays with a brick manufacturer.

Assisted market analyst in determining ball clay and kaolin market in California.

Identified chromium mineral causing discoloration of product produced by a glass company.

Assisted a company geologist in interpreting structures and in constructing a cross-section through a fault zone.

Advised contractor on possible locations for reactor that would avoid seismic areas; and on location of microwave stations in relation to active faults.

Consulted with city park officials regarding development of park facilities in a landslide area.

Assisted talc company in planning diamond drilling program.

Provided data on limestone deposits to out-of-state producer interested in entering California market.

Helped owner determine tonnage of large tailings dump and recommended sampling method.

Recommended geologic localities to a film producer engaged in making an educational film on "Earth's Crust." Provided technical terms for script.

Advised foreign geologist on practicality of a placer operation along the Amargosa River.

Provided safety officer with information on safety devices used in mine ventilation examination.

Supplied manufacturer of ore concentrators with information on use and processors of silica.

Provided potential mineral-producing concern with information on land laws and gold-dredging ordinances.

Supplied report and comments on mineral resources of county to County Economic Commissioner.

Consulted with County Planning Commissioner as to reasonable operating regulations for new cement plant.

Transmitted data on evaluation of dredge tailings to mining engineer examining a local deposit.

Discussed future mineral development of northern California area with geologist of large lumber company.

Inasmuch as the branch offices, along with the San Francisco office, afford convenient centers from which to conduct much of the investigatory work of the division, the statistical summary following presents only a very limited portrayal of the total effectiveness of each office. It does provide a record of certain information service accomplishments for the year.

Two of the Branch offices, Sacramento and Los Angeles, were required to relocate during the year because of space needs of other state agencies. In September 1959, the Los Angeles office was moved from the State Building into temporary quarters in the Ohrbach Building pend-

	Redding	*Sacramento*	*San Francisco*	*Los Angeles*
Visitors	793	2221	31,381	4580
Incoming telephone calls	483	1587	6,654	6238
Incoming mail	2,069	3962	45,481	4643
Outgoing mail	1,231	2543	14,387	2749
Free publications distributed	387	——	——	——
Publications sold (number)	197	1450	——	3411
Publications sold (value)	$178	$1,521	$25,391	$4,123

ing completion of the new State Building. Some 2 weeks of work were involved in this move, on the part of every member of the staff. Regrettably the Los Angeles office is faced with another move sometime in the coming year. The Sacramento office, fortunately, was required to move only across the hall, on the 4th floor of the building in which it has been housed for nearly two years. Little time was lost, and the new quarters, which provide a little more floor space, offer opportunities for better display of specimens and for more convenient public study facilities.

Reference Libraries

Since its establishment 80 years ago the Division of Mines has maintained, in accordance with the Public Resources Code, "a library of books, reports, and drawings bearing upon the mineral industries, the sciences of mineralogy and geology and the arts of mining and metallurgy . . . available for reference and examination, and open to public inspection at reasonable hours." For these fields of study the library has become a major center in this region, the collection now numbering about 24,000 volumes and 15,000 maps, and with 250 periodicals and newspapers currently being received.

In keeping with the responsibility of the Division to provide basic information on the geology and mineral resources and industries of California, pertinent material from all sources concerning this state forms the nucleus of the collection. To serve an industry centered here which is world-wide in its operation the library has actively maintained and extended its exchange program with all of the other states, with the geological surveys of Canada and its provinces, and with similar agencies and institutions throughout the world. It is a complete depository for the publications of the U.S. Bureau of Mines and U.S. Geological Survey.

The classified sections of the book collection are comprehensive in geology and its branches and in mining engineering, and there is broad representation in such fields as petroleum engineering, ceramics, cement, construction, earthquake engineering, chemical technology, land use, and resources development. Files of the early western surveys, books on the gold rush, older mining company reports, and many items on mining communities accumulated over the years, are used by students of California regional and local history. During the year some 350 titles were submitted for the inclusion in a new edition of a bibliography on California local history being prepared by the California Library Association which will list the holdings of participating libraries.

Division of Mines publications are distributed to the public libraries and college and university libraries in California, and in recent years

several hundred high school and district teachers libraries have been placed on the mailing list. During the year 97 elementary schools received the school library kit, a group of recent bulletins, maps and other publications, selected for their suitability in conservation studies. A total of 941 publications was sent by stock order, in addition to the regular mailing list, in response to requests from libraries and other institutions. Eighteen new addresses were placed on the mailing list and new exchanges were established with institutions in England, Switzerland, and Argentina.

Use of the library materials by the public and by members of the staff has continued at a high level. There were 102 loans to other libraries or agencies and 13 incoming loans. On several occasions during the year Mr. KempvanEe donated government publications. Dr. Olaf P. Jenkins was donor of his fine set of 141 U.S. Geological Survey Folio Atlases. A gift of aerial photographic negatives suitable for geologic interpretation was received from the United States Steel Company.

At each of the branch offices, small working libraries and a number of the more frequently used mining and mineral industry journals are available for public consultation. The principal new book acquisitions of the year are listed in the appendix.

Topographic Maps

The Division of Mines performs two services regarding the topographic maps of California. One is the maintenance of a complete file of maps for public reference purposes. The other is to serve as one of a group of agencies checking advance prints of California topographic maps for the U.S. Geological Survey.

During the course of the fiscal year, measures were taken to streamline the method of distributing and filing of topographic maps. This was done in order to lessen the amount of time deducted from state map work, inasmuch as these two responsibilities are at present handled by the same personnel. Nevertheless, by the end of the fiscal year several hundred topographic maps remained unfiled and a backlog of work was building up. It is hoped that the typist-clerk, requested to assist in the map room, will take over these non-technical duties and give the entire reserve stock of maps a complete overhaul by the time the Division moves into its new quarters. New map drawers (consisting of 19 units of 5 drawers each) were requested for the 1961-62 budget, with which to replace the insecure and unsatisfactory open shelving on which the maps are presently stored.

Mineralogy and Petrology Laboratory

During the 1959-60 fiscal year, the public service laboratory received a total of 3,379 samples of rocks, minerals, and ores. Each sample was identified and a descriptive report mailed to the sender. When requested, a statement of possible economic value and a list of possible buyers was included with the report. A decrease of some 15 percent in the number of samples as compared to 1958-59 may be attributed to a general decline in prospecting. The closing of the General Services Administration chromium, manganese and tungsten buying programs

was probably the largest contributing factor to the decline in prospecting.

During routine examination of samples submitted for identification, unusual minerals or minerals from new localities are often discovered by the technical staff of the public services laboratory. Of special note this year was a sample of an unusual copper, nickel, and cobalt-bearing mineral found in the Coyote Mountains of San Diego County. Further investigation of this mineral will be done when the Division's new research laboratory is completed. A sample of sanbornite, a rare barium silicate mineral named after a former Division of Mines staff member, was identified and found to be from a new locality. This locality, plus a new locality found last year, makes a total of three California occurrences for this rare mineral which has been reported only from California. A sample of vonsenite, a rare iron magnesium borate mineral named after a California mineral collector, was also identified this year and confirmed by later field work as coming from a new locality in Monterey County.

A staff geologist from the Geological Survey of Greece and now on a United Nations' fellowship, spent seven weeks under tutelage of the technical staff, and in studying the methods used in the public service laboratory for mineral identification.

Mineral Exhibits

The fiscal year 1959-60 again saw a number of accomplishments in the mineral exhibits. Cataloging of the minerals in the Dana section and the County cases was completed. An inventory of the minerals in other cases and drawers was made. The storeroom was reorganized to give more working space. Pictures of early day mining operations were displayed in order to give visitors an insight into this colorful period in California's history.

The model of the Calaveras Cement Plant, the stamp mill, the display of fluorescent minerals and the fossil exhibit tied to the geologic time scale are all attractions which proved interesting to our visitors. A model of the underground workings of the Idaho Maryland gold mine was donated to the Division of Mines. When a glass-topped case is constructed to protect this model of one of the country's largest gold mines, it will be displayed in the mineral exhibit as an unique added attraction.

The mineral exhibits continue to welcome large groups of people. During the 1959-60 fiscal year this section of the Division of Mines had 20,286 visitors. Of this total, 16,783 or 82 percent were adults, and 3,503 or 18 percent were school children. It may be of interest to note that 7,109 or 35 percent of the total number of people visited the mineral exhibits in the months of May, June, and July. Many of these visitors were from other states and nations, but a majority of them came from California and the elementary schools in San Francisco Bay area.

The principal part of the exhibit, on the second floor of the Ferry Building, is open to the public between 9 a.m. and 4 p.m., Monday through Friday. A small portion on the third floor is open from 8:30 a.m. to 5:00 p.m. Both are closed on weekends and holidays. Small exhibits are maintained at each of the Division of Mines branch offices

in Los Angeles, Sacramento, and Redding. Because of limited space these are restricted largely to materials of local significance.

A paper on the Division's mineral exhibit by George L. Gary and Robert A. Matthews was published in the September 1959 issue of *Mineral Information Service*. It describes the history and growth of what is now one of the larger and more complete mineral collections in the United States. A comprehensive map showing the arrangement and location of the various classes of rocks and minerals, in the 170 cases comprising the collection, was included in the paper as a guide for visitors and as an aid to the staff. Over twenty-five thousand copies of this 12-page paper have been distributed to the public and to institutions.

A total of 211 sets of California minerals (called "Schoolite Sets" by the Division of Mines) were provided upon request without charge to the elementary schools throughout California. This number represents a decrease of about 9 percent under the previous fiscal year 1958-59 and indicates that our distribution of this educational material is fulfilling the requirements of our elementary school system.

The Division of Mines arranged an exhibit at the 1959 State Fair. Specimens of important minerals produced in the state were on display, together with sample copies of published material pertaining to these minerals and descriptive labels informing the public of their significance to the state's economy. Other exhibits explained the functions and activities of the Division of Mines, and displayed typical examples of various publications and maps issued by the Division. A special display showed progress on the new State Geological Map.

Cooperation with California Federation of Mineralogical Societies

Participation in the annual show of the California Federation of Mineralogical Societies and in annual meetings of many of the constituent societies is an important facet of the Division's public service program. The extent of this participation has increased considerably over the past few years and because of this increase, there has been concern that too large a proportion of Division effort might eventually be devoted to this one phase of the program. Therefore, following a series of meetings between representatives of the Division of Mines and the California Federation of Mineralogical Societies—in particular, the Federation's program coordinator, Jack Donahue—a suitable plan was formulated and agreed upon.

California has been divided into 9 districts as indicated on the accompanying map. The basis for the district boundaries was determined by geographic location, frequency of Division of Mines representation, membership of societies, and number of society shows. The plan provides for participation in no more than one show in each district per year. Requests for Division of Mines representation at society meetings are placed through the Federation's Show Date Coordinator. In this way control of the Division's time and effort is maintained, and an equitable distribution of participation, with respect to the Mineralogical Societies, is assured.

Ore Buyers Inspection

The Division of Mines, under the Ore Buyers License Act, Chapters 2250 to 2275, inclusive, of the Public Resources Code, Division II, issues licenses annually to any person or association of persons purchasing gold in any form for resale. The Ore Buyers Inspector in the headquarters office in San Francisco and the assistant inspector in the Los Angeles branch office check the records and activities of each licensee several times a year for any violations under this act.

Each licensee is provided with a pamphlet issued by the Division of Mines concerning the regulatory chapters of the Ore Buyers License Act, commonly referred to as "The High Grade Bill." This information, together with advice from the inspectors who call upon the licensees, has resulted in a minimum of violations.

Twenty-two unlimited licenses, allowing purchases of $1,000 or more, and thirty-six limited licenses, allowing purchases of less than $1,000, were issued during the fiscal year. This is a decrease of four from the preceding fiscal year.

Public Appearances and Professional Contributions

	1959-60	*1958-59*
Meetings attended	215	250
Active participation	89	120
Talks presented	40	48
Events at which publications were sold (Chiefly at fairs and mineral shows)	14	15
Total sales at such events	$633.30	$1,056.58

Meetings attended. Includes meetings of scientific and professional societies, rock and mineral clubs, mineral shows. *Not included:* Legislative hearings, state governmental committees and inter-agency conferences, seminars and scientific lectures attended at local universities.

Active participation. Includes presenting papers and functioning as officers for the programs of the American Association of Petroleum Geologists; American Institute of Mining, Metallurgical and Petroleum Engineers; Geological Society of America; Western Governors' Mining Advisory Council; local technical societies; and serving at Mineral Shows. *Not included:* Committee activities of AAPG, AIME, GSA, AGI; Departmental committees on Personnel and Training, Safety, State Fair exhibit; Division committees; U.C. Clay Committee.

Talks presented. The following titles are representative of the topics requested by the various groups.

Geology and mineralogy of California jade
Potentials of the mining industry
Functions of the Division of Mines
Chemical analyses of rocks and minerals
History of mining in California
Geology of West Yellowstone earthquake
Diamonds in California
Butler Estate chrome mine
Geothermal power
Geology of the Sierra Nevada
California's gold mining
Quartz family minerals

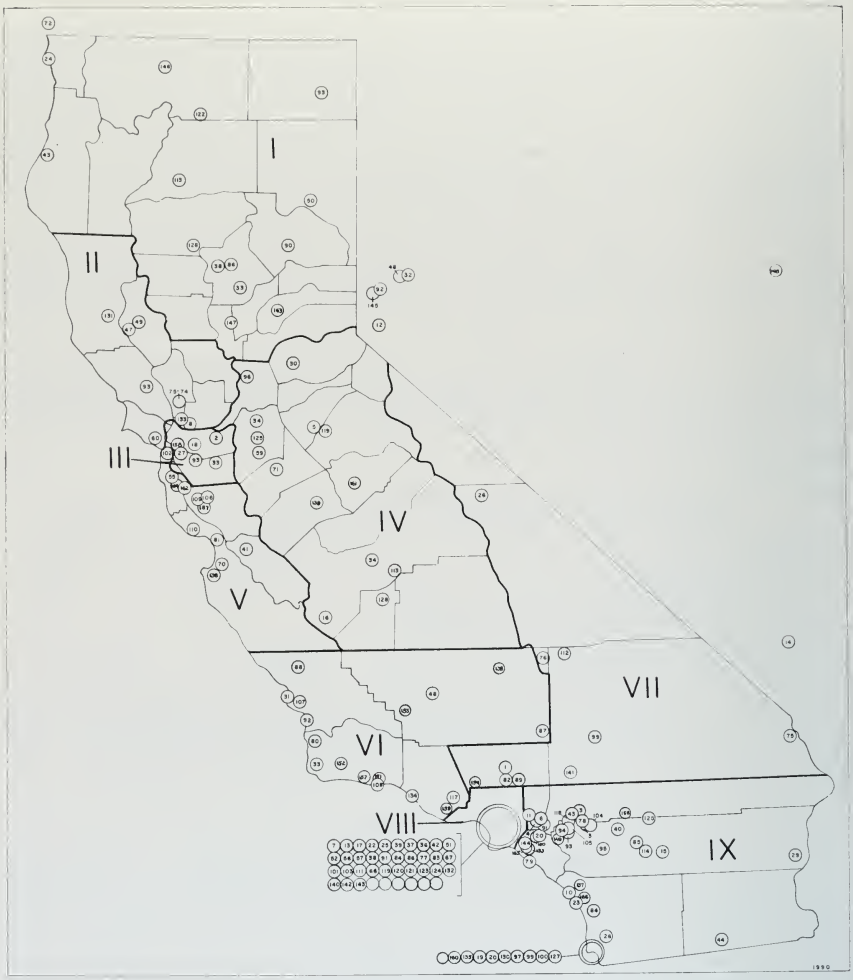


FIGURE 3. Index of member societies of the California Federation of Mineralogical Societies

CFMS District	Map Number	
7	1.	The Antelope Valley Gem and Mineral Society
3	2.	The Antioch Lapidary Club
9	3.	Arrowhead Mineralogical Society, Inc.
9	4.	Baldwin Park Mineral and Lapidary Club, Inc.
9	5.	Banning Mineral Society
9	6.	Bear Gulch Rock Club
8	7.	Bellflower Gem & Mineral Society
2	8.	Benicia Rock & Gem Club, Inc.
4	9.	Calaveras Gem and Mineral Society, Inc.
9	10.	Camp Pendleton Rockhounds
9	11.	The Canyon City Lapidary Society, Inc.
0	12.	Carson City Mineral Society
8	13.	The Centinela Valley Gem and Mineral Club, Inc.
0	14.	Clark County Gem Collectors, Inc.
9	15.	Coachella Valley Mineral Society, Inc.
4	16.	Coalinga Rockhound Society
8	17.	Compton Gem & Mineral Club, Inc.
3	18.	Contra Costa Mineral & Gem Society, Inc.
9	19.	Convair Rockhound Club
9	20.	The Convair Pomona Rockhound Club
9	21.	De Anza Mineral Society
8	22.	Del-Air Rockhound Club
9	23.	Del Norte Gem & Mineral Society
1	24.	Del Norte Rock Hounds, Inc.
8	25.	Delvers Gem and Mineral Society, Inc.
9	26.	The Desert Gem and Mineral Society
3	27.	East Bay Mineral Society
7	28.	Eastern Sierra Gem and Mineral Club Inc.
9	29.	The El Cajon Valley Gem & Mineral Society
4	30.	The El Dorado County Mineral & Gem Society
6	31.	The Estero Bay Gem & Mineral Club, Inc.
0	32.	Fallon Rock and Gem Club, Inc.
1	33.	Feather River Gem and Mineral Society, Inc.
4	34.	Fresno Gem and Mineral Society
5	35.	The Gem and Mineral Society of San Mateo County, Inc.
8	36.	The Gem Cutters Guild, Los Angeles

CFMS District	Map Number	
8	37.	Glendale Lapidary & Gem Society, Inc.
1	38.	Golden Empire Mineral Society
8	39.	Hea Mineral & Gem Society
9	40.	Hi-Desert Rockhounds
5	41.	Hollister Gem and Lapidary Club
8	42.	Hollywood Lapidary and Mineral Society
1	43.	The Humboldt Gem and Mineral Society
9	44.	Imperial Valley Gem & Mineral Society
9	45.	Kaiser Recreation Rock Club
6	46.	Kern County Mineral Society, Inc.
2	47.	Konocti Rock Club
0	48.	The Lahontan Gem & Mineral Club, Inc.
2	49.	Lake County Diamond and Mineral Society
1	50.	Lassen Rocks and Minerals Society
8	51.	L.E.R.C. Mining & Prospecting Club
8	52.	L.E.R.C. Rockcrafters Club
3	53.	Livermore Valley Lithophiles
4	54.	Lodi Gem & Mineral Socity, Inc.
6	55.	Lompoc Gem and Mineral Club, Inc.
8	56.	Long Beach Mineral and Gem Society
8	57.	The Los Angeles Lapidary Society
8	58.	The Los Angeles Mineralogical Society
4	59.	Manteca Gem and Mineral Club
2	60.	Marin Mineral Society
8	61.	Marquardt Mineral and Lapidary Club
6	62.	Mid-Coast Gem & Mineral Club
3	63.	Mineral and Gem Society of Castro Valley
8	64.	The Mineralogical Society of Southern California, Inc.
1	65.	Modoc Gem & Mineral Society
7	66.	The Mojave Desert Gem and Mineral Society
6	67.	Mojave Mineralogical Society, Inc.
8	68.	Monrovia Rockhounds
8	69.	The Montebello Mineral and Lapidary Society, Inc.
5	70.	Monterey Bay Mineral Society
4	71.	Mother Lode Mineral Society
0	72.	Mt. Emily Gem and Mineral Club
2	73.	Napa Junior Rock Club
2	74.	Napa Valley Rock and Gem Club, Inc.
7	75.	The Needles Gem & Mineral Club
7	76.	NOTS Rockhounds
8	77.	N.R.C. Gem and Mineral Club
9	78.	Orange Belt Mineralogical Society Society, Inc.
9	79.	Orange Coast Mineral & Lapidary
6	80.	The Orcutt Mineral Club
5	81.	The Pajaro Valley Rockhounds, Inc.
7	82.	Palmdale Gem & Mineral Club
9	83.	Palm Springs Lapidary Club
9	84.	Palomar Gem & Mineral Club
8	85.	Palos Verdes Gem and Mineral Society
1	86.	The Paradise Gem and Mineral Club, Inc.
8	87.	The Pasadena Lapidary Society, Inc.
6	88.	Paso Robles Mineral Club, Inc.
7	89.	Pearblossom Gem & Mineralogical Society
1	90.	Plumas Mineral Society
9	91.	The Pomona Valley Mineral Club, Inc.
0	92.	Pyramid Gem & Mineral Society, Inc.
2	93.	Redwood Gem and Mineral Society, Inc.
9	94.	Riverside County Chamber of Mines & Gem Societies
9	95.	The Riverside Gem and Mineral Society, Inc.
9	96.	The Rock-A-Teers Mineral Club of Hemet, California
9	97.	The Rohr Rockhounds
4	98.	The Sacramento Mineral Society, Inc.
9	99.	San Diego Lapidary Society, Inc.
9	100.	The San Diego Mineral & Gem Society, Inc.
8	101.	San Fernando Valley Mineral and Gem Society, Inc.
5	102.	The San Francisco Gem & Mineral Society, Inc.
8	103.	The San Gabriel Valley Lapidary Society, Inc.
9	104.	San Gorgonio Mineral and Gem Society, Inc.
5	105.	San Jacinto-Hemet Rockhounds, Inc.
5	106.	San Jose Lapidary Society, Inc.
6	107.	San Luis Obispo Gem & Mineral Club, Inc.
6	108.	Santa Barbara Mineral and Gem Society
5	109.	Santa Clara Valley Gem and Mineral Society
5	110.	Santa Cruz Mineral and Gem Society, Inc.
8	111.	Santa Monica Gemological Society, Inc.
7	112.	Searles Lake Gem and Mineral Society, Inc.
4	113.	Sequoia Mineral Society
9	114.	Shadow Mountain Gem and Mineral Society, Inc.
1	115.	Shasta Gem & Mineral Society, Inc.
4	116.	Sierra Mineral and Gem Society of Tuolumne County, Inc.
6	117.	Simi Valley Rock Club
9	118.	Slover Gem and Mineral Society
8	119.	South Bay Lapidary and Mineral Society, Inc.
8	120.	Southern California Jr. Mineralogists
8	121.	Southern California Mineral Identification Society
1	122.	Southern Siskiyou Gem & Mineral Society, Inc.
8	123.	South Gate Mineral and Lapidary Club
8	124.	The Southwest Mineralogists, Inc.
4	125.	The Stockton Lapidary and Mineral Society
1	126.	The Tehama Gem and Mineral Society, Inc.
9	127.	The Tourmaline Gem and Mineral Society
4	128.	Tule Gem and Mineral Society
9	129.	Twentynine Palms Gem and Mineral Society
9	130.	U. S. Navy Electronics Laboratory Mineral and Gem Club
2	131.	Ukiah Stone and Gem Club
8	132.	Valley Independent Petrologists
2	133.	Vallejo Gem and Mineral Society, Inc.
6	134.	Ventura Gem & Mineral Society, Inc.
9	135.	Astronautics Rockhound Club
5	136.	Carmel Valley Gem & Mineral Society
9	137.	Fallbrook Gem & Mineral Society, Inc.
6	138.	Kern Valley Gem & Mineral Society
4	139.	Merced Gem & Mineral Society
8	140.	Verdugo Hills Gem and Mineral Society
7	141.	Victor Valley Gem & Mineral Club
8	142.	The Walt Disney Gem & Mineral Society
0	143.	Washoe Gem & Mineral Society, Inc.
9	144.	West Coast Mineral Society
8	145.	The Whittier Gem and Mineral Society, Inc.
1	146.	The Yreka Rock and Mineral Club
1	147.	Yuba-Sutter Mineral Society
0	148.	Mt. Wheeler Gem & Mineral Club
9	149.	NOR-CO Rock and Gem Club
9	150.	Pomona Rockhounds
6	151.	Santa Barbara Jr. Mineral Club
6	152.	Santa Ynez Valley Rock Club
9	153.	Searchers Gem & Mineral Society
7	154.	Sierra Pelona Rock Club, Inc.
6	155.	Taft West Side Gemstone & Mineral Society
9	156.	Yucca Valley Gem & Mineral Society
6	157.	Goleta Gem & Mineral Society
3	158.	Berkeley Gem & Mineral Society
6	159.	Conejo Valley Rockhounds
9	160.	Independent Order of Foresters Rockhounds
4	161.	Mariposa Gem & Mineral Society
5	162.	L.E.R.C. Gem & Mineral Club (Sunnyvale)
1	163.	Grass Valley Gem & Mineral Society
5	164.	Palo Alto Geology Society, Inc.
9	165.	Northrup Recreation Gem & Mineral Club
9	166.	Vista Gem & Mineral Society
5	167.	Campbell Gem & Mineral Guild

IV. MATTERS OF HISTORICAL, STATISTICAL, COOPERATIVE, AND ADMINISTRATIVE INTEREST

A. California's Mineral Industry

The Mineral Wealth of California in 1959. The value of California mineral production totaled $1.433 billion (preliminary) in 1959. Compared with a total value of $1.500 billion in 1958, the 1959 figure represented a decline of 4 percent. Although 1959 was the second straight year for which a decline was reported, the value was only 13 percent less than the all-time high of $1.652 billion recorded in 1957.

Petroleum production dropped for the sixth consecutive year. The decline in the price paid for crude oil, which began in 1958, continued unabated through 1959 and accentuated the drop in the dollar value of this commodity. Drilling activity was near the lowest level of the post-World War II period with the most successful developments centered around fields in the extreme southern end of the San Joaquin Valley. The short supply of native natural gas provided a strong incentive to continued exploration for dry gas fields in the Sacramento Valley.

The value of production in the metals group was off owing chiefly to the cessation of chrome mining and declines in the production of gold and mercury. The termination of the Government stockpile program for chromite ore and concentrates in 1958 left the domestic miners without a market and no production was made in 1959.

Gold production was at the lowest point since 1944 owing chiefly to the curtailment of bucketline dredging operations along the flood plain of the American River in Sacramento County. The Natomas Company continued to diversify its activities by entering fields other than gold mining where a greater return on capital investment can be realized. Three bucketline dredges of the Yuba Consolidated Gold Fields continued to produce placer gold from the lower Yuba River in Yuba County.

Two lode gold mines in the Downieville-Alleghany area of Sierra County (the Brush Creek mine and the Sixteen-to-one mine) constitute the last outpost of the underground gold mines in California. Mining at the Hazel Creek mine in El Dorado County was curtailed by a fire which destroyed the mill during the early part of the year. The Siskon open-pit lode gold mine continued to cyanide gold ore previously stockpiled between the Florida and Tennessee pits. The near-term outlook for low-grade underground gold mining may be indicated by the sale of the surface properties of the Idaho-Maryland mines in Grass Valley for a home subdivision; and the auction sale of all equipment, including head-frame and hoisting machinery, at the Empire Star mines in Grass Valley. These two were the last of the large, deep, underground lode gold mines worked in the state. Small-scale, intermittent, partner-type gold prospecting and mining was noted in Alpine, Amador, Butte, Calaveras, Kern, Madera, Mariposa, Placer, Plumas, San Bernardino, Shasta, and Tuolumne Counties.

Unhampered by weather conditions, the production of iron ore continued at a pace slightly under that of 1958, despite the steel strike. Most of the production was from the Eagle Mountain mine in Riverside County.

Under the stimulus of an approaching deadline, the manganese mines made a concerted effort to produce ore and concentrates for the government stockpile. About 85 percent of the production was high-grade shipping ore from the counties of Humboldt, Imperial, Plumas, Riverside, Sonoma, and San Bernardino. An all-time high in the dollar value of production was attained. Substantial shipments of ore were made from the Queen's Peak mine discovered in western Humboldt County late in 1958. As this deposit is outside the limits of previously known manganese districts, it opened up a new area for future prospecting. The quota for the carlot program was completed in August 1959, and since it left the domestic mines without a profitable market for their ore, the mines closed almost immediately.

Mercury production which had reached a 15-year high in 1958, dropped about 22 percent in 1959. This was partly the result of depleted ore reserves at some mines, and narrowing profit margins at others. The principal producing mines were: the New Idria, the Abbott, the Mt. Jackson, the Buena Vista, the New Almaden, and the Altoona.

The price of mercury, which was relatively stable during the year, averaged $231 per flask in the first half, but weakened to $215 per flask in mid-December. The general outlook for the consumption of mercury remained good owing to the constantly increasing demand for conventional uses and the emphasis on new technological developments for its use in the field of nuclear power.

The production and value of tungsten and molybdenum concentrates from the Pine Creek mine in Inyo County were below the 1958 figures.

One of the outstanding developments of the year in the industrial minerals section of the California mineral industry was the attainment of all-time highs in both quantity and value of production by the following commodities: borate minerals, cement, diatomite, gypsum, magnesium compounds, sodium salts, and sand and gravel.

Recent industrial expansion on the West Coast has greatly enlarged the market for short-fiber chrysotile asbestos and has accelerated its exploration. The Division of Mines has been studying asbestos deposits and has been instrumental in stimulating and indicating the direction for this exploration. The U. S. Bureau of Mines completed core-drilling a promising deposit on the north slopes of Mt. Eddy, Siskiyou County, and the work of evaluating the cores was under way. A deposit southeast of Copperopolis, Calaveras County, was trenched and core-drilled during the year. An extensive and unique deposit about 30 miles northwest of Coalinga in Fresno and San Benito Counties also was under exploration by a number of substantial companies. Here, a large volume of serpentine has been sheared and altered to produce a flaky mixture of chrysotile and talc. Studies are being made by those companies on the separation and potential use of the component minerals.

The upward trend in cement production which was resumed in 1958 continued into 1959 with modernization and plant expansion still in evidence. Ideal Cement Company plant at San Juan Bautista, San Benito County, which had been placed on a stand-by basis in 1958, was reopened early in 1959. At Oro Grande in San Bernardino County, the Riverside Division of American Cement Company spent $6,000,000 in modernization by the installation of a new automatic crushing, blending, and rock storage facility. The selection of raw materials will be

accelerated by the use of a process control digital computer. Two large rotary kilns were installed to replace five small obsolete kilns on the same property. The Calaveras Cement Division of Flintkote acquired a limestone deposit and plant site at Gray Rocks 12 miles northeast of Redding, and began building a new plant in that area. The raw material will be mined from the McCloud limestone of Permian age. Ample supplies of clay-shale for cement are also available. A southern California cement company acquired an inactive clay and limestone deposit at Volcano in Amador County.

Three southern California concrete block manufacturers joined forces to develop and mine a deposit of blue shale of Miocene age in the Chino Hills 35 miles east of Los Angeles. An expanding plant was erected on the site and "Shalite", a well-rounded light-weight aggregate with an external skin will be produced.

In the Panoche Hills west of Mendota, a new deposit of gypsite was opened, mined, and the material was being sold to local farmers for the correction of alkali soils.

A large deposit of massive greenstone, part of the Logtown Ridge formation of Upper Jurassic age, was acquired by the Minnesota Mining and Manufacturing Company as a result of previous test drilling. The greenstone will be mined for use as roofing granules. Vein quartz was mined by the Reno Silica Company from a large deposit at Crystal Peak in eastern Sierra County for use in the production of silicon. The Lowry Paving Company erected a plant near Colfax to produce silica flour by grinding white quartz gravel from the Bear River, Placer County.

In 1959, home and industrial building was up, creating an increased demand and resulting in increased production of sand and gravel and stone. The slow-down in Federal highway construction, however, resulting from the delay in releasing funds under the Federal Highway Act, resulted in a drop in noncommercial (government agencies and contractors) production. Nevertheless the overall total (commercial and noncommercial production) of sand and gravel and stone was higher in 1959 than in 1958.

B. Staff of the Division

Unlike the preceding year, which saw virtually no changes in the staff of the Division, the current year has involved additions, separations and changes. Two members of the technical staff, district mining engineer J. C. O'Brien and assistant mining engineer Henry H. Symons, reached the age of retirement and have left active service with the Division. Both had served the Division and the state long and faithfully, Mr. O'Brien in recent years as supervisor of the Redding branch office, and Mr. Symons as head of the information desk in the San Francisco office.

Other changes are indicated in the staff list which follows. In the preceding annual report, the staff list, in addition to noting the technical assignments, included reference to staff committee work. Since relatively few changes in the personnel of the committees have taken place in the current year, only committee chairmanships of the more active committees are noted below.

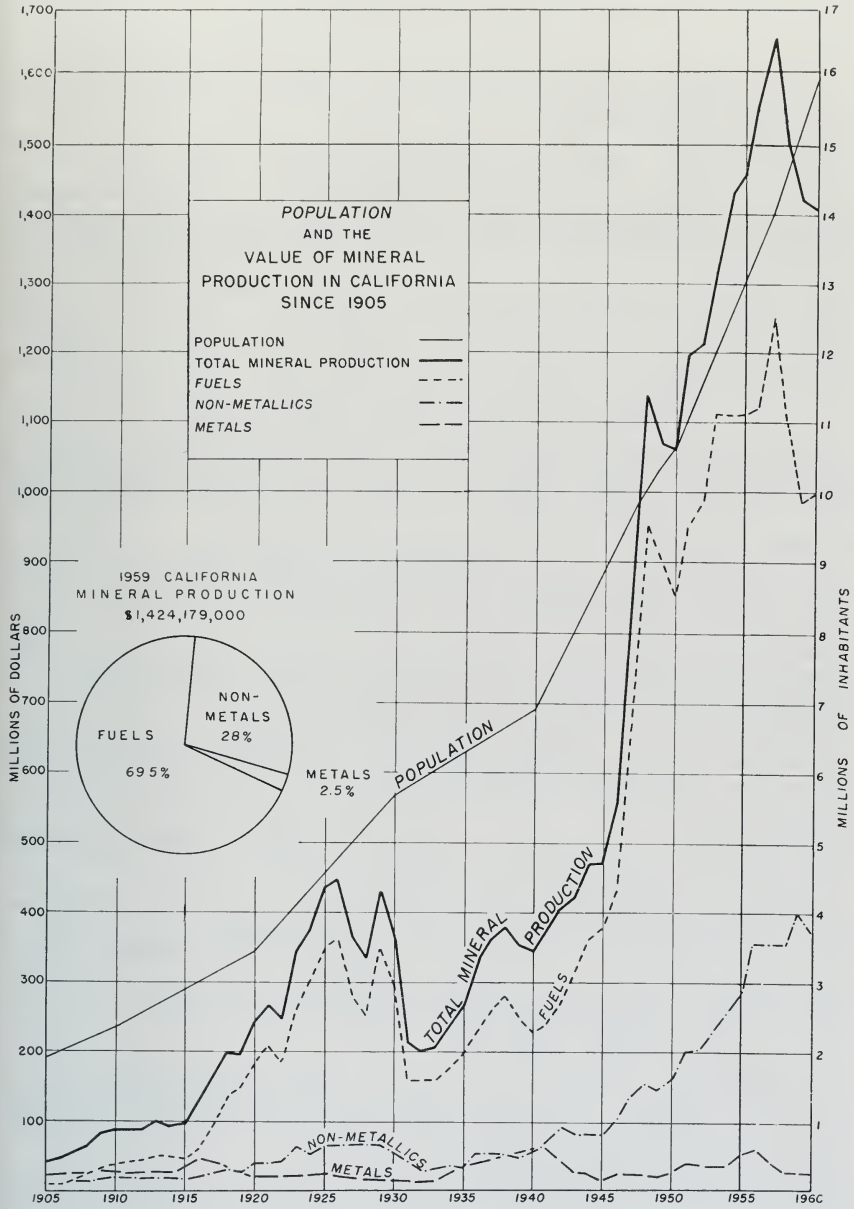

POPULATION
AND THE
VALUE OF MINERAL
PRODUCTION IN CALIFORNIA
SINCE 1905
POPULATION
TOTAL MINERAL PRODUCTION
FUELS
NON-METALLICS
METALS
1959 CALIFORNIA
MINERAL PRODUCTION
$1,424,179,000
FUELS
69.5%
NON-
METALS
28%
METALS
2.5%
POPULATION
TOTAL MINERAL PRODUCTION
FUELS
NON-METALLICS
METALS
MILLIONS OF DOLLARS
MILLIONS OF INHABITANTS
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960

FIGURE 4.

STAFF ASSIGNMENTS
(in San Francisco, unless noted otherwise)

ALFORD, JUNE E. Secretarial services, Redding, July 1959 to March 1960.

ALFORS, JOHN T. Laboratory technician from April 1960; spectrographic study of chrome and manganese ores.

ARTIST, RICHARD J. Clerical services, stockroom.

AUNE, QUINTIN A. Antimony, arsenic, bismuth; geologic reconnaissance Alturas area; Modoc County; Cosumnes-Indian Diggins limestone.

BOWEN, OLIVER E. JR. Supervision of geologic surveys and guidebooks section; cement, limestone and dolomite; bulletin on limestone and dolomite; Monterey and El Portal quadrangles; Cherokee mine; mineral deposits of the Oro Grande series near Victorville.

BURGESS, MARY L. Secretary to Chief; supervision of stenographic services; personnel documents, information and employee records.

BURNETT, JOHN L. Expansible shale; state geologic map; geology of the southern Sierra Nevada; index to geologic mapping; soapstone.

CAMPBELL, DORRIS P. Secretary to Deputy Chief and to Senior Mining Geologist in charge of geologic surveys and guidebooks sections.

CAMPBELL, IAN. State Mineralogist and Chief, Division of Mines.

CHESTERMAN, CHARLES W. Supervision of Mineralogy-Petrology section; pumice and perlite, volcanic rocks, fluorspar, jade; Matterhorn Peak and Bodie quadrangles; Dublin Hills area; project advisor, State map reconnaissance, Westwood sheet (Gay and Lydon); northeast Chico sheet (Stinson); expansible shale (Burnett).

CHOPPELAS, ARETE M. Secretarial services, Editorial section.

CLARK, ELIZABETH W. Secretarial services, Los Angeles office.

CLARK, WILLIAM B. Supervision of Sacramento branch office; technical information services; Calaveras, Placer, and Sutter Counties; gold, platinum; Greenwood quadrangle; Chairman, Committee on County Reports.

CLEVELAND, GEORGE B. Los Angeles office; aluminum, clay, diatomite; Otay bentonite; Little Antelope clay; filtrol bentonite; clay in San Diego and Kern Counties; Long Valley diatomaceous earth; Chairman, Committee on Commodities.

CLOSE, NANCY E. In charge of Fiscal Control section.

COLLINS, ELIZABETH. Assisting in the Library; preparation of subject guide, and consolidated indexes of Division publications; secretary to Senior Mining Geologist in charge of technical information services.

CRIPPEN, RICHARD A. JR. Supervision of Drafting section; drafting illustrations for publication.

DAVIS, FENELON F. Supervision of technical information services and mineral economics section; mining activities; manganese, mercury; Alameda County.

DEMARTINI, MARIO. Guard and janitorial services.

DOHERTY, LUCY. Secretary to Senior Mining Geologist in charge of county reports and administrative services, and to Ore Buyers Inspector.

EGENHOFF, ELISABETH L. Supervision of Editorial section; technical editing; history of mineral discovery and mining in California.

ELSEY, ROGER. Laboratory technician, October 1959 to March 1960.

EVANS, JAMES R. Los Angeles office; Riverside County; geology and mineral resources of Mescal Range quadrangle.

GARY, GEORGE L. Mineral exhibits; ore buyers inspection and licenses.

GAY, THOMAS E., JR. Technical information services at Redding branch office; Supervision of Redding office from October 1959; geologic reconnaissance Alturas area; Modoc County; Coffee Creek area; iron and ferroalloys; east Westwood sheet; Chairman, Committee on Supervision.

GOLDMAN, HAROLD B. Dimension stone and rock products; Alameda County; Franciscan chert in concrete aggregate; reactive materials in aggregates; aggregate resources of river-drainage systems; *Mineral Information Service* coordinator.

GRAY, CLIFFTON H., JR. Los Angeles office; limestone and dolomite; tin; Corona South quadrangle; Orange and Riverside Counties.

HART, EARL W. Asphalt and bituminous rock, natural gas, natural-gas liquids, petroleum; Standard limestone and dolomite; Kern County petroleum; Monterey County.

HERNDON, EVANGELINE M. Secretarial services, electronic transcription.

JENNINGS, CHARLES W. Supervision of state geologic map; review of geologic maps for publication; Hernandez Valley quadrangle; coal, peat; Chairman, Committee on Maps and Mapping.

KELLEY, FREDERIC R. Clay, phosphates; Cretaceous stratigraphy, Joaquin Rocks quadrangle; Cherokee sediments; geologic names editor.

KIESSLING, EDMUND W. On educational leave to October 1959. Technical information services at Sacramento branch office from December 1959; Sutter County.

KONIGSTEDT, ROBERT W. Clerical services, stockroom.

KOONTZ, SYLVIA L. Assisting in Drafting section, to September 1959.

KUHNEN, MARJORIE E. Secretarial services, Redding, from March 1960.

LEWIS, GERRY. Typist in Minerals Research laboratory, September 1959 to March 1960.

LOUIE, JEANNETTE W. Secretarial services, Information section; receptionist, headquarters office.

LYDON, PHILIP A. Technical information services at Sacramento branch office; at Redding office from December 1959; Kaiser Peak quadrangle; W Westwood sheet; E Redding sheet.

MATTHEWS, ROBERT A. Mineralogy-Petrology section, Public Service Laboratory; Butler Estate chromite mine and associated asbestos resources; mineral exhibits.

MCNITT, JAMES R. SE Kelseyville 7½′ quadrangle; The Geysers; 15′ Kelseyville; alteration stages ultrabasic rocks; geothermal power developments.

MORTON, PAUL K. Los Angeles office; ore deposits of Kern County; cadmium, lead, silver, zinc (southern California), gold (southern California).

NELSON, ZOE ANNE. Secretarial services, Sacramento.

NISSON, W. H. Laboratory Technician from December 1959; chemical analysis.

OAKESHOTT, GORDON B. Deputy Chief, Division of Mines; Division administration; geology of the Coast and Transverse Ranges; geology of active faults and earthquakes.

O'BRIEN, J. C. Supervision of Redding branch office; copper, zinc; Shasta and Trinity Counties; retired September 30, 1959.

PAPINA, MARY ANN. Secretarial services, Mineralogy-Petrology section.

REYNOLDS, BEATRICE L. Secretary to Supervising Mining Geologist, Los Angeles office.

REUSCHLEIN, JOHN W. Clerical services, Los Angeles, from February 1960.

RHODES, ELINOR H. Drafting illustrations for publication to December 1959.

RICE, MARY HILL. Technical editing; *Mineral Information Service*; photography.

RICE, SALEM J. Asbestos, chromite, cobalt, nickel, serpentine; geologic guide to north coast; caves of California; Ukiah reconnaissance.

ROSE, EVELYN. Typist in Minerals Research Laboratory, from March 1960.

SANSBURN, WILLIAM A. Supervision of the Library; Librarian.

SAUL, RICHARD B. Los Angeles office; Riverside County; manganese (southern California); geology of parts of Inyo Mts.

SMITH, R. MERL. Drafting illustrations for publication, January 1960 to June 1960.

STEWART, BARBARA J. Assisting in the Library, to May 1960.

STEWART, RICHARD M. Assisting Chief and Deputy Chief in Division administration and supervision; supervision of administrative services and county resources reports sections; mineral utilization.

STINSON, MELVIN C. Assisting in supervision of Mineralogy-Petrology section; black sands, minor metals, rare-earth elements, uranium, vanadium, zirconium and hafnium; Chilcoot and Haiwee Reservoir quadrangles; 30′ Chico.

STRAND, RUDOLPH G. State geologic map; index to geologic mapping; supervision of topographic map file.

SYMONS, HENRY H. Technical information services; mineral economics and statistics; mining operations; retired March 1, 1960.

TATCHER, LOUISE L. Assisting in the Library, from June 1960.

TROXEL, BENNIE W. Assisting in supervision of the Los Angeles branch office; molybdenum, thorium, tungsten, wollastonite; Shadow Mountains and southern Death Valley; Kern County.

TSUCHIYA, STANLEY T. Supervision of stockroom facility; mail and publications distribution.

VER PLANCK, WILLIAM E. Bulletin on silica; borates, bromine and iodine, calcium chloride, gypsum, lithium, magnesium compounds, nitrogen compounds, potash, salines, sodium salts, strontium compounds; Chairman, Committee on Publications, from February 18, 1960.

WALLACE, JAMES O. Clerical services, Los Angeles, to December 1959.

WEBER, DORISMAE. Drafting illustrations for publication from October 1959.

Weber, F. Harold, Jr. Los Angeles office; San Diego County; geology and mineral deposits of part of Ord Mts.; barite.

Weeks, David L. Clerical services, stockroom, to June 1960.

Westbrooks, Andrew J., Jr. Janitorial services.

Wilson, Dianne E. Assisting in Fiscal Control section.

Wright, Lauren A. Supervision of the Los Angeles branch office; geology of southern Death Valley; beryllium, optical calcite, feldspar, gem stones, kyanite, mica, quartz crystal, talc and pyrophyllite; Chairman, Committee on Publications to February 1960.

C. Financial Statement

The statement of expenditures for the fiscal year 1959-60 is approximate as all bills for the year were not available for payment at the time these figures were compiled. These approximate expenditures from the General Fund are compared below with actual expenditures for the years from 1955-56.

Expenditures 1955-56	$488,761
(3.6 percent increase over 54-55)	
Expenditures 1956-57	545,747
(11.6 percent increase over 55-56)	
Expenditures 1957-58	638,496
(17.0 percent increase over 56-57)	
Expenditures 1958-59 (approx.)	639,448
(0.1 percent increase over 57-58)	
Expenditures 1959-60 (approx.)	662,163
(3.6 percent increase over 1958-59)	

These increases reflect the need for the Division of Mines to continue to provide helpful and efficient services to the growing population of the state at a level set by public demand. The expenditures listed below include increases in the costs of equipment, supplies, services, and salaries.

The Division's research program, authorized by the Legislature by means of a special appropriation for 1959-60, proceeded slowly owing to problems of recruitment and laboratory and office space. Expenditures for 1959-60, from the State Lands Act Fund, are summarized as follows:

Salaries and wages	$18,273	(includes reimbursement to General Fund for pro rata administration costs)
Operating expenses	39,686	
Equipment	37,796	
Total	$95,755	

D. Administration of the Division

Included in the report of the preceding year under the heading of "an administrative experiment" was a brief discussion of the establishment of a number of committees charged with reviewing various facets of the Division's operations and with making recommendations for ways in which these operations might further be improved.

Brief reports submitted by some of the more active of these committees follow. Some of the recommendations made by the committees have already been instituted; others are under review by the Division administration.

Committee on Commodities. The commodity program is a major activity of the Division of Mines, and as such, individual commodity

EXPENDITURES
Fiscal 1959-60

Total salaries and wages		$424,256.44
Operating expenses		
General expense	$9,968.35	
Printing special	75,701.46	
Printing general	1,450.18	
Communications: telephone, etc.	7,140.36	
Communications: postage	10,279.41	
Traveling out of state	1,569.43	
Traveling in state	18,452.55	
Motor vehicle operations	9,239.51	
Rent land and buildings	33,870.79	
Utilities	2,576.76	
Technical reports	4,916.00	
Recurring repair and maintenance facilities structures	1,262.01	
Conservation exhibits	93.13	
Engineering reproduction and photography	2,057.41	
Laboratory	4,591.00	
Library services	1,086.35	
Expendable accountable equipment	443.88	
Total operating expenses		$184,698.58
Equipment		
Automobile (replacement)	2,374.63	
Laboratory (replacement and additional)	1,010.12	
Office (replacement and additional)	3,650.49	
Miscellaneous replacements	106.50	
Miscellaneous additional	1,105.30	
Federal surplus property, lab and field	51.00	
Total equipment		8,298.04
Other current expenses		
Geological exploration in cooperation with U.S. Geological Survey	35,000.00	
Publication of colored state geologic map		
Rent $600.00		
Lithographer 9,310.00	9,910.00	
Total other expenses current		44,910.00
Grand total expenditures		662,163.06
Appropriation reimbursement: Subscriptions to *Mineral Information Service*	11,891.78	
Sale of Publications	20,571.65	
Sale of State Geologic Map sheets	9,434.30	
Pro rata (research) from State Lands Act Fund	10,087.00	
Total appropriation reimbursement		51,984.73
Grand net total, current operations, General Fund		$610,178.33

studies are among the prime products of the Division staff. For effective administration of this program periodic scrutiny of its aims and the methods used to achieve them is needed. To analyze the commodity work, first an *ad hoc* and later an interim committee was established. The committee collected background information by circulating questionnaires dealing with many phases of commodity work, and by individual discussions with staff members. Careful study revealed a need

for greater productivity, for increased emphasis on original research and for certain modifications in the organization of the program.

To implement an improved program the committee recommended in part: (1) to reduce the number of commodity specialists and thereby intensify and up-grade studies on a relatively few commodities, (2) to reduce the study of certain commodities to a relatively few projects, thus saving the time and effort that might needlessly be expended by assigning a full-time commodity specialist, (3) to establish certain commodities and commodity projects as of first importance using criteria established by the committee, (4) to assign commodity work according to a procedure initiated by the committee and thereby insuring a more equitable distribution of work and studies of the more important subjects, (5) to issue periodically a commodity bulletin such as Division of Mines Bulletin 176 as a method of maintaining adequate information on all commodities, and (6) to dispense with certain use categories as commodity study units, i.e. special sands, abrasives, so that these uses may be treated under the appropriate mineral commodities, and to divide certain important commodities into more easily studied units with a separate commodity specialist for each, e.g., divide clay into "kaolinite" and "bentonite".

Committee on County Reports. The committee on county reports was organized to review all matters pertaining to the county reports program. Periodic meetings were held beginning in September during which the organization, contents, objectives, and scheduling of county reports were reviewed. In addition, a considerable amount of discussion was devoted to the methods used in the preparation of county reports. A fairly detailed guide was prepared, which it is hoped will be of assistance to the authors and result in a considerable saving of time and effort.

It was recommended that county report work continue to be a major function of the Division. Although the committee would like to see an increase in the number of staff members assigned to such projects, it is realized that such an increase could only be made by sacrificing other major programs. It is felt that better use can be made of the man hours presently available. The assignment of personnel to county report work should depend on a number of factors, the most important of which are demand, backlog of completed reports and status of reports being processed, and availability of personnel from completion of other projects.

One of the objectives of this committee was to study the feasibility of coordinating this program with the mineral commodity program. We have recommended that the two programs not be integrated. However, close coordination should be maintained between these two as well as with other major programs. It was recommended that a tabulated type of report be used in the next two long county reports where the properties and mineral deposits number in the hundreds or thousands. A suggested order of assignment of future county reports was prepared, the priority having been determined by the date of last report, demand, population trends, nature and abundance of mineral commodities, and value of production. The counties in the first priority are Santa Barbara, Ventura, San Luis Obispo, Humboldt, and Plumas.

Committee on Maps and Mapping. The new Committee on Maps and Mapping, established during the 1958-59 fiscal year, continued to consider improvements which could be made in Division activities involving geologic maps. Since the acceptance of the recommendation for reconnaissance geologic mapping for the State Geologic Map, continued attention has been given to the matter of recommending specific areas for study, and an informal sub-committee was established to advise and coordinate the mapping in the southern Sierra Nevada. The mapping accomplished in areas suggested by the Committee has proved to be very satisfactory and constitutes a valuable contribution to the State Geologic Map.

During the course of the year, recommendations were made concerning various improvements in the format of the State Geologic Map sheets. The Committee outlined several possible improvements in the U. S. Geological Survey Co-op mapping program and the Chairman participated in a conference with the Survey to review and clarify mutual objectives. The effectiveness of the Division's purchase of reports fund for obtaining new geologic mapping was discussed, and some alternatives were considered. The part that geologic mapping plays in Division activities was reviewed and recommendations for a more active geologic mapping program were made.

Committee on Publications. The Committee on Publications largely completed the phase of its assignment having to do with fact-finding and the recommendations of policy. During the year it concentrated on the review of manuscripts that have been submitted for publication, using the procedure that had been established in the preceding year. At the beginning of the current year 51 manuscripts that had been submitted for publication were on hand. Of these, 26 seemed to be ready for consideration; the rest were unfinished or lacking in some respect. In the course of subsequent review 4 were returned to their authors as not suited to the Division publication program. During the year 17 more manuscripts were received from Division of Mines or outside authors. The status of the 64 manuscripts which at the end of the year constitutes the Division's publication backlog, is as follows:

Approved for publication

1. Chandra: Colfax, Foresthill quadrangles
2. Clark: Calaveras County
3. Droste: Playa clay minerals
4. Hanna, Gester: Pliocene lake beds near Dorris
5. Irwin: North Coast Ranges
6. Klein, Goldman: Kern River aggregate materials
7. Murdoch, Webb: Bulletin 173 supplement
8. Troxel et al.: Kern County

Placed on open file in library

1. Brewer: China Mountain quadrangle
2. Dunn: Western Mono Lake
3. Herron: Highland, San Juan Creek
4. Herrera: Tent Hills quadrangle
5. Higgins: Northwestern Sonoma County
6. Klein: Hazel Creek mine
7. Vickery: Geomorphology of San Francisco Bay
8. Randall: Type sections, San Luis Obispo County

Revision in progress following technical review

1. Conrey: Lower Pliocene, Los Angeles basin
2. Graham: Bibliography of Cretaceous microfossils

3. Maddock: Mt. Boardman
4. Plafker: Kaweah southwest quadrangle
5. Proctor: Coachella Valley
6. Samsel: Southeast quarter, Cross Mountain quadrangle
7. Weber: San Diego County

Technical review in progress

1. Carman: Lockwood Valley area
2. Clary: East part, Clark Mountains
3. Creeley: Oroville area
4. Darrow: Montara Mountain
5. Dibblee: Central Santa Ynez Mountains
6. Dibblee: Opal Mountain, Fremont Peak areas
7. Halliday: Caves of California
8. Lawton: Morgan Valley, Wilbur Springs area
9. Merriam: Cuyapaipe, Campo area
10. Weidman: King City area

Ready for technical review but not assigned

1. Dickinson: Church Creek area
2. Pampeyan: Mt. Diablo area

Preliminary evaluation by Committee on Publications

1. Bishop: South flank Santa Susana Mountains
2. Brabb: Big Basin area
3. Churkin: Gazelle limestone
4. Cox: Helena quadrangle
5. McLaughlin: Warthan Canyon
6. Pease: Sobrante anticline
7. Pelletier: Carbona quadrangle

Awaiting action

1. Hays: Mecca Hills
2. Novotny: Shadow Mountains
3. Mielenz: Hernandez Valley area
4. Peryam: Annette 7½′ quadrangle
5. Shaw: Detrital minerals, Sierra Nevada
6. Soliman: Isabel, Eylar quadrangles
7. Shuler: San Timoteo Canyon area
8. Dibblee: Caliente 30′ quadrangle
9. Hall, Brooks, Jones: Pescadero, Ano Nuevo area
10. Halsey: Northwest Bridgeport quadrangle
11. Heizer: Geologic time
12. Heizer: Prehistoric cartography
13. Isaacs: Commatti Canyon
14. Johnson: Masonic mining district
15. Leo: Ben Lomond Mountain
16. MacIvor: Thousand Oaks
17. Payne: New Idria quadrangle
18. Richards: Funeral Mountains
19. Rieben: Mortar-Durmid area
20. Schilling: Pacheco Pass area
21. Slemmons: Sonora Pass area
22. Steuer: Mud Lakes tungsten

Committee on Supervision. The Committee on Supervision was established as an outgrowth of an earlier brief study of supervisory practices in the Division. The mission of the Committee, very broadly expressed, is to consider problems and recommend improvements in the fields of technical supervision, orientation and training, performance evaluation, and the organization and structure of the Division.

In attacking the many problems involved, the Committee has taken the general approach that morale and performance of Division personnel—both technical and non-technical—can best be improved by 1) clarifying the relationships between management and working staff, 2) improving organizational systems that establish the proper function

of every individual, and 3) increasing the general awareness of the importance of improved communications techniques and interpersonal relationships. Most of the facets of personnel management have come under the Committee's scope of activities. The Committee has worked in close cooperation with and been strongly assisted by the Department Personnel and Training Officers from the Division of Administration in Sacramento.

A primary concern was to explore and evaluate the Division's existing personnel program and policies, to determine whether improvement was needed, and if so what type and how much. Following the committee's recommendation a three-day exploratory session was conducted by the Department Personnel and Training officers for all supervisors to discuss possible training needs in the areas of supervision and management. Also a 12-page "Employee Opinion and Attitude Survey" questionnaire, comprising 54 questions, was prepared and administered by the Committee with the aid of the Department staff. The 57 responses (from the 62 persons then in the Division), entirely anonymous, were tabulated and the results distributed to all the staff. A number of attitudes and specific comments were expressed, both critical and complimentary. A detailed analysis of the survey results was underway at the close of the fiscal year to formulate recommendations for specific management actions that would wherever possible improve conditions revealed as unsatisfactory. In the meantime, much spontaneous improvement has already resulted—simply from the fact that the survey had focused attention of all personnel upon the problems of supervision.

Other specific actions and considerations by the Committee involved these topics:

1. Orientation: data of various sorts, from many sources, are being assembled in a loose-leaf Orientation Manual, copies of which are to be distributed to all present and new Division personnel.
2. Personnel reports: the Committee recommended the abolition of the obsolescent Field Activities report form and is redesigning the Monthly Progress Report form as a consequence of a careful study of its intended and actual usefulness.
3. Performance reports: the Committee studied the proposed revisions of long-standing State Performance Evaluation forms, and recommended the Division's participation in a pilot program to try out the new form. Two training sessions were conducted by the Department Training Officer for Division supervisors on the general purposes of performance reports, and on interviewing techniques and the application of improved principles in using the new form.
4. Performance standards: the Committee considered the advisability of preparing detailed performance standards for every job in the Division. Examples of performance standards were studied and trial forms for Division jobs are in preparation.
5. Central records: the Committee recognized the need for, and is considering an operative plan to organize a central record of all technical assignments and projects, to enable management more effectively to plan, coordinate, control, and review the Division's projects and work programs.
6. Division organization: considerable Committee effort has been directed at reviewing Division goals, policies, programs, personnel policy, and organization, with the purpose of recommending needed improvements and a more effective organization plan.
7. Other activities: Committee personnel were active in preparing Employee Development Appraisal forms that were used in the promotion of groups of Junior and Assistant Mining Geologists. A Committee member served as the Division's representative on the newly formed Department Personnel and Training Committee. As a "watchdog" group, the Committee called general attention to departures from approved policies of supervision.

The success of very few experiments—especially those involving people and long-term projects—can be judged immediately. Nevertheless this experiment with a "committee system" or "participating democracy," as it has been called, has produced results, many of which must already be reckoned on the credit side of the Division's operations. There have inevitably been some debits, yet there seems little question but that on the whole the "experiment" has been a success and that it deserves to be continued, possibly in modified form, as an operational procedure.

E. Cooperative Programs

The Division of Mines engages in a number of cooperative programs involving Federal, State and private agencies, and individuals. Some of these programs are formalized and include specific budget allocations; others are largely informal and cost-free. All are designed to meet the basic objective of promoting investigations and gaining information, helpful to the mineral industries, in the most efficient ways possible.

U.S. Geological Survey

For many years, the Division has maintained a cooperative arrangement with the Mineral Deposits Branch of the U.S. Geological Survey whereby the Federal Government matches, dollar-for-dollar, the investment made by the State in this program. As in the preceding year, the State's allocation in 1959-60 amounted to $35,000. A report on the Survey's program, prepared by Allan B. Griggs, in charge of the Mineral Deposits Branch at the Menlo Park Office of the Survey, follows.

REPORT OF THE U.S. GEOLOGICAL SURVEY ON COOPERATIVE STUDIES OF MINERALIZED AREAS IN CALIFORNIA (FISCAL YEAR 1960)*

By Allan B. Griggs, U.S. Geological Survey, Menlo Park, California

The U.S. Geological Survey continued its investigations of mineralized areas in California during the fiscal year beginning July 1, 1959 under a cooperative agreement with the California Division of Mines. Five projects, South Klamath Mountains, Sierra Foothills mineral belt, Eastern Sierra tungsten, Searles Lake, and Furnace Creek borate projects were continued from the previous year and the Independence quadrangle was added to the program, having been started in July 1959. Other activities of the Geologic Division of the U.S. Geological Survey in California are summarized elsewhere in this report.

South Klamath Mountains Project (William P. Irwin, project geologist). The South Klamath Mountains project is a study of a tier of two and one-half 15-minute quadrangles near the southern margin of the Klamath Mountains province in northern California. The quadrangles, from east to west, are the west half of the French Gulch quadrangle in Shasta County, and the Weaverville and Hayfork quadrangles in Trinity County. These quadrangles adjoin on the east an area in the vicinity of Redding which has been reported upon in U.S. Geological Survey Professional Paper 285, "Geology and Base Metal De-

* Publication authorized by the Director, U. S. Geological Survey.

posits of the West Shasta Copper-Zinc District, Shasta County, California." The geologic mapping of a strip of country westward from the West Shasta district will result in a much better understanding of the structure and stratigraphy of the whole province and more exact appraisal of the mineral resources.

Throughout this part of the Klamath Mountains province the rock formations and the structural features have a north-northwest trend, and the group of quadrangles being mapped lie across this trend almost at right angles. Within the French Gulch quadrangle the major rock units are the Copley greenstone of Devonian(?) age, the Balaklala rhyolite of Devonian age, the Bragdon formation of Mississippian age, and granodiorite of the Shasta Bally batholith. About half of the Shasta Bally batholith crops out within the southwestern part of the French Gulch quadrangle and much of the remainder within the adjoining Weaverville quadrangle. A belt of metamorphic rocks which consists of two units, the Salmon hornblende schist and Abrams mica schist, both presumably of pre-Silurian age, occupies most of the Weaverville quadrangle. The remaining eastern part of this quadrangle is underlain by a large area of ultramafic rocks and relatively small areas of Copley greenstone and Bragdon formation in addition to the western part of the Shasta Bally batholith. The southwestern part of the Weaverville quadrangle and much of the Hayfork quadrangle are underlain by slate, chert, and greenstone of probable Paleozoic age. These have been intruded by dioritic, mafic, and ultramafic rocks. Marine sedimentary rocks of early Cretaceous age and continental sands and conglomerate of the Weaverville formation of early Tertiary age are preserved in a downfaulted block in the central part of the Weaverville quadrangle.

Geologic mapping is continuing in the Weaverville quadrangle and is estimated to be completed by the spring of 1961. This work has demonstrated that the Salmon hornblende schist and the Abrams mica schist lie within a synclinorium. The Abrams occupies the trough, and thus structurally overlies the Salmon; heretofore the Abrams was considered to be the older of the two formations.

Two reports are being prepared on the French Gulch quadrangle and are nearly ready for critical review. One describes the mineral deposits and the other the stratigraphy and structure of the quadrangle. The project geologist collaborated on a paper describing the K-feldspar content of graywackes of Jurassic and Cretaceous ages in the northern Coast Ranges and Sacramento Valley which was published in the Bulletin of the American Association of Petroleum Geologists for December 1959 and also prepared a short report describing the relations between the Salmon and Abrams formations for publication in U.S. Geological Survey Professional Paper 400-B. Additional time was spent gathering data and working on a report on the Franciscan formation; this report is to be written jointly by several members of the Geological Survey. The project geologist prepared a road log and led a field trip along the Trinity River for the Sacramento Geological Society in the spring of 1960.

Sierra Foothills Mineral Belt Project (Lorin D. Clark, project geologist). The area included in the geologic study of the Sierra Foothills mineral belt is on the lower western slope of the Sierra Nevada and

extends northward from the latitude of Yosemite National Park to the North Fork of the Feather River. It is from 30 to 40 miles wide and about 160 miles long, and trends N. 30° W. This area is underlain by deformed metamorphic rocks that are bounded on the east by the Sierra Nevada batholith and on the west by the line of overlap of undeformed strata of the Central Valley.

The present studies involve detailed mapping along major streams which flow westward across the area and at about right angles to the geologic structure. From these investigations and supplementary information from older geologic maps a more detailed and better understanding of the stratigraphy and structure has resulted.

The metamorphic rocks were derived from sedimentary and volcanic rocks of Paleozoic and Mesozoic ages. Two distinct stages of deformation have been recognized throughout the region, the first resulting in major folds with essentially horizontal axes and the second in major faults and widespread minor folds with nearly vertical axes. Some of the individual faults as well as the system of which they are a part extend throughout the metamorphic belt. Faults that controlled deposition of quartz veins and gold ore bodies of the Mother Lode belt are apparently younger and structurally less important features superimposed on one of the fault zones of the large system. Detailed mapping along the rivers has refined earlier concepts of the stratigraphy as well as the structure and permits the recognition of several new stratigraphic units in both the Paleozoic and Mesozoic sections.

During fiscal year 1960, geologic traverses were completed along Silver Creek, Slate Creek, South Fork of the Cosumnes River, and Middle Fork of the Feather River. Two large-scale plane table maps showing structural details in small areas on Camp Creek and the South Yuba Rivers were completed. A report on the stratigraphy and structure of the part of the western Sierra Nevada metamorphic belt extending from the Merced River northward to the Cosumnes River was revised following review by the Geologic Division. A paper entitled "Foothills Fault System, Western Sierra Nevada, California" was published in Volume 71 of the *Bulletin* of the Geological Society of America. The project geologist also contributed to the review paper on the Sierra Nevada batholith, which is described under the Eastern Sierra tungsten project.

A short summary of the evidence for two stages of deformation of the metamorphic rocks was prepared for U.S. Geological Survey Professional Paper 400-B.

Eastern Sierra Tungsten Project (Charles D. Rinehart, project geologist). The area being investigated under the Eastern Sierra Tungsten Project includes three 15-minute quadrangles north and west of the Bishop tungsten district. Mapping has been completed in all three quadrangles, Casa Diablo Mountain, Mt. Morrison, and Devils Postpile. Two reports have been published on the Casa Diablo Mountain quadrangle, and publication of another on the geology and mineral deposits of the Mt. Morrison quadrangle has been authorized by the Director of the U.S. Geological Survey.

Field work in the Devils Postpile quadrangle, the westernmost of the tier of three, was completed by the end of the 1959 field season. The quadrangle includes an extensive roof pendant within the Sierra

Nevada batholith that consists chiefly of metamorphosed volcanic rocks and minor amounts of metamorphosed sedimentary rocks. These rocks are on strike with rocks in a pendant in the Mt. Morrison quadrangle, which are predominantly older metamorphosed sedimentary rocks. The rocks in the two pendants make up a section more than 60,000 feet thick containing fossils of Ordovician, Pennsylvanian, Permian, and early Jurassic ages. A short paper entitled "Paleozoic and Mesozoic Fossils in a Thick Stratigraphic Section in the Eastern Sierra Nevada, California" was published in Volume 70 of the *Bulletin* of the Geological Society of America.

A report on the Devils Postpile quadrangle is scheduled for completion by July 1961. Work during the winter of 1959-60 consisted mainly of petrographic studies of metamorphic rocks from the pendant, and final revision of the Mt. Morrison report. During the spring of 1960 the project geologist spent some time collaborating with others on a review article upon a part of the Sierra Nevada batholith. The area involved roughly coincides with the Mariposa sheet of the Army Map Service, which includes a strip extending from the White and Inyo Mountains on the east to the San Joaquin Valley on the west. The purpose of the report is to bring together data and ideas gained by several individuals working in separate areas into a summary on the composition, setting, and mode of emplacement of the batholith.

Searles Lake Project (George I. Smith, project geologist). The Searles Lake Project has now been included in the cooperative program for two years. About half of the past fiscal year has been spent completing and revising reports of investigations in the Searles Lake area undertaken before the project became a part of the cooperative program, and half has been spent in investigation and preparation of reports started since its entry. In September 1959, a preliminary draft of a manuscript was completed describing the composition and stratigraphy of the evaporites in Searles Lake. A report on the geology and petrology of the Lava Mountains area, on the south edge of the Searles Lake basin, was revised extensively and prepared for transmittal at the end of the fiscal year for publication. A short note on one part of this work was prepared for publication in U.S. Geological Survey Professional Paper 400-B.

The study of the surficial deposits in Searles Lake basin was started this year and is still in its very early stages. Only about a third of the unconsolidated deposits have been mapped, and these in a preliminary form, but by combining data from this mapping with those from the subsurface section described in the completed report on the evaporites in the lake, several general conclusions are warranted. Most of the exposed lake deposits were formed during the stand of the younger of the two major lakes that have occupied the basin in late Quaternary time. This younger lake rose to a level about 500 feet above the present valley floor but never overflowed; but the subsurface evidence and the distribution of identifiable sediments and separable generations of lake-deposited tufa support this conclusion. This lake existed during an interval that lasted from about 23,000 to 10,000 years ago and its deposits are correlated with the Tioga glacial deposits in the Sierra Nevada. Deposits attributed to the previous major lake are exposed in only a few areas although subsurface data and the highest and most

prominent shoreline supply an unmistakable record of its existence. The waters of this lake rose to the level of the spillway in the basin, about 650 feet above the present valley floor. Subsurface evidence shows that this lake ceased to exist about 35,000 years ago but had remained as a large body of water for approximately 100,000 years prior to that time; the thick deposits of shoreline tufa and the eroded shoreline suggest that the overflow level was maintained for several thousand years. The deposits of this older lake are correlated with the Tahoe glacial deposits in the Sierra Nevada. To some extent, the mineralogy of the exposed lake sediments can be related to the mineralogy of the equivalent subsurface lake sediments and the evaporites that subsequently formed when each lake desiccated, but the details of this correlation are not yet worked out.

An outgrowth of the geologic mapping around the Searles Lake basin has been the recognition of a major northwest-trending dike swarm in the bedrock areas on the north side of the Garlock fault and west of the basin. This swarm has been compared and correlated with a similar one mapped in a much earlier stage of the project on the south side of the Garlock fault and about 40 miles to the east. The composition of the dike rocks, their trend and degree of parallelism, and their probable geologic age are similar; furthermore, no other dike swarms with these properties have been located anywhere along the trace of the fault. The left-lateral Garlock fault is held responsible for their 40 miles of separation. An abstract and paper describing the evidence are being prepared for the presentation at the annual meeting of the Geological Society of America.

Furnace Creek Borate Project (James F. McAllister, project geologist). The main area of the Furnace Creek borate project extends from the floor of Death Valley near the Harmony Borax Works southeastward for nearly 30 miles between the Funeral and Black Mountains and across the Greenwater Range to the Lila C mine in the Amargosa Valley. It is generally 6 miles wide and lies diagonally across the Furnace Creek and Ryan 15-minute quadrangles in Inyo County. An additional area, which is about 20 miles farther southeast in the Stewart Valley quadrangle, consists of several square miles around the currently active Gerstley borate mine near Shoshone. The project area includes all the borate mines of the region, other known borate deposits in Tertiary rocks, and the most favorable ground for discovering concealed deposits. The mines were major producers before mining started in the Kramer district in 1927.

All the known borates of the area, except minor accumulations in surface crusts of considerable mineralogic interest, are in the Furnace Creek formation of late Tertiary age. The principal deposits of colemanite, ulexite, and probertite are interlayered in lake mudstone and limestone above a conglomerate that marks the base of the formation throughout the area. Minor deposits of more varied borate minerals are in veins that cut massive and fragmental olivine basalt higher in the Furnace Creek formation. Some colemanite replaces gypsum in upper lake beds of the formation.

The Furnace Creek formation lies conformably on the Artist Drive formation in the Black Mountains and unconformably on Paleozoic rocks at some places in the Funeral Mountains, but it is more generally

faulted against the Paleozoic rocks. The Artist Drive formation within the area consists of barren lake beds, conglomerate, and interlayered colorful volcanic rocks. Above the Furnace Creek formation, the Funeral fanglomerate containing flows of Ryan basalt of local usage is unconformable except near the floor of Death Valley. The Furnace Creek and Artist Drive formations form a broad syncline that contains some minor folds and trends southeastward between the flanking mountains. Along the southwest limb of the syncline in the Black Mountains a network of faults curves west toward Death Valley, and along the northeast limb the Furnace Creek fault zone marks the front of the Funeral Mountains. The structure becomes more complex on the west side of the Greenwater Range where slightly deformed Ryan basalt (of local usage) makes a pronounced angular unconformity on the Artist Drive and Furnace Creek formations. The basalt caps the range east of mines in the largest high-grade borate deposits of the area.

Detailed geologic mapping has been finished southeastward to the top of the Greenwater Range. A preliminary geologic map of this part, supplemented by structure sections and a short text, is being prepared for publication by the California Division of Mines. A paper on "Gowerite, a New Hydrous Calcium Borate from the Death Valley Region, California" was published in volume 44 of the *American Mineralogist*. A manuscript on nobleite, another new hydrous calcium borate from the Death Valley region, is being processed for publication in the same journal.

Independence quadrangle (Donald C. Ross, project geologist). The Independence quadrangle covers an area of about 250 square miles in east-central California; about half of the quadrangle is in the Inyo Mountains and the remainder is in Owens Valley. About half of the mountainous portion of the quadrangle, which rises from 4,000 feet to nearly 11,000 feet, is made up of three granite masses, two of which are of batholithic proportions. These masses essentially enclose a section of more or less metamorphosed Paleozoic rocks ranging in age from Middle(?) Cambrian to Permian(?).

The project began in July 1959, and about two months were spent in the area in a general reconnaissance of the stratigraphy and in detailed geologic mapping of parts of the two larger granitic masses. The winter of 1959-60 was spent in petrographic studies of the granitic rocks, studies of the literature of related Paleozoic sections, and petrographic studies of the Paleozoic rocks. In June of 1960 the detailed mapping of the Paleozoic rocks was begun in the Willow Springs area and is now proceeding northward through the quadrangle. Major emphasis in the study of the area will be on the Paleozoic stratigraphy and on the stratigraphic and structural setting of a variety of small mineral deposits including lead-zinc-silver, gold-silver, copper, iron, talc, and tungsten.

Preliminary mapping suggests that the structure, though grossly simple, is locally complex, and the easily definable mappable units should serve as good markers for demonstrating the structural development of this part of the Inyo Mountains. Preliminary petrographic studies also suggest this area will be a good place to study the effects of contact metamorphism and variations in metamorphism in dif-

ferent kinds of Paleozoic sediments at different distances from granitic contacts.

Reports on Completed Cooperative Projects. The reports entitled "Geologic Reconnaissance of the Northern Coast Ranges and Klamath Mountains" and "Geology and Mineral Deposits of Mt. Diablo, Contra Costa County", have been transmitted to the California Division of Mines for publication. Publication of reports on the Darwin and Mt. Pinchot quadrangles has been authorized and they are being readied for publication as a Professional Paper and Bulletin by the Geological Survey. The final report of the Bishop tungsten project has been critically reviewed and is being processed prior to being authorized for publication. The economic report on the Panamint Butte quadrangle and the adjacent Modoc mining district also is being processed prior to authorization for publication. Although not done under the auspices of the cooperative program, the report, "A Geologic Reconnaissance in the Southeastern Mojave Desert", publication of which has been authorized, will be transmitted during the summer of 1960 to the California Division of Mines for publication.

U.S. Bureau of Mines

Both the State Division of Mines and the U. S Bureau of Mines have responsibilities for collecting, filing, and disseminating statistics on the mineral industry of the state. In order to spare mine operators the necessity of filling out annually two sets of production data, one for each of these agencies, the Bureau and the Division have for a number of years successfully formalized a cooperative arrangement whereby the Bureau gathers the statistics on the State's mining industry, and the Division provides geologic background information on the mineral deposits as well as location and operating data for operating mines. The tabulated data are published by the U.S. Bureau of Mines in its *Minerals Yearbook*. The Division publishes the data annually as county tables, charts, and other forms most useful to California citizens.

In addition there was initiated during the year an important program whereby, as the result of an authorization and budget augmentation by the State Legislature, the Division of Mines is able to provide funds to further mineral research conducted by the Bureau. Accordingly, we include at this point the report prepared by R. B. Maurer, Regional Director for the U.S. Bureau of Mines, on these projects which offer interesting potential to many aspects of California's mineral industry.

REPORT OF THE U.S. BUREAU OF MINES ON COOPERATIVE MINERAL RESOURCES AND RESEARCH STUDIES IN CALIFORNIA (Fiscal Year 1960)*

By R. B. Maurer, U. S. Bureau of Mines
Region II, San Francisco, California

The U. S. Department of the Interior, Bureau of Mines, has cooperated continuously since 1948 under a formal agreement with the State Division of Mines by collecting statistics on annual mineral production from mine operators. These figures are tabulated, and are rearranged and interpreted by the Division as required in its reports. The basis of cooperation was broadened in May 1958 by an additional agreement

* Publication authorized by the Director, U.S. Bureau of Mines.

that provides for the pooling of information on mining properties and the publication of such data by the Division or on a joint basis. During the past year the Division, where it had no comparable data, availed itself of much material in the Bureau of Mines files and used it in revising county resource reports. The Bureau recently published Information Circular No. 7898, "Sulfur in California and Nevada", and Report of Investigations No. 5579, "Reconnaissance of California Manganese Deposits". Geologic and other data from Division of Mines publications were used in both the Bureau's publications.

An innovation in State-Federal Government cooperative mineral research was instituted late in 1959 with the agreement of the Division and the Bureau to collaborate in investigating matters of mutual interest. The Division elected to support financially the expansion of the following research programs of the Bureau on the basis of maximum benefit to California's mineral industries: (1) Production of tungsten and molybdenum metal by direct electrolysis of scheelite concentrate, (2) Development of useful coproducts from the anorthosite rock of the San Gabriel Mountains, California, and (3) Slope stability studies in open pits. Final authorization to proceed with the work was received in January 1960. The State's contribution of $35,000 to the research that was under the direction and control of the Bureau at its facilities, supplemented the approximately $106,000 of Bureau funds spent in this effort. There was collaboration, also, in the field investigation of nickel and cobalt mineralization that are subject to inundation at the site of the new Trinity River Dam and reservoir. Reconnaissance by a team comprising a Division of Mines geologist and Bureau mining engineers indicated that the deposit is relatively unimportant and furthermore is almost entirely above the maximum water level.

Tungsten Research. The research program is directed toward developing a new, simple, economic method for utilizing scheelite from domestic mines—now largely inoperable due to low world prices for tungsten ores—to produce commercial-grade tungsten and molybdenum metals. Initial metallurgical studies, described in Bureau of Mines Report of Investigations No. 5554, "Electrowinning Tungsten and Associated Molybdenum from Scheelite", showed that fused-bath electrolysis is applicable for the selective separation of tungsten. At low current densities, molybdenum is deposited very rapidly on the cathode. By changing cathodes and increasing the current density, tungsten then is deposited on the second cathode. The purity of the tungsten metal produced ranges from 99.7 to 99.9 percent. The highest purity for the molybdenum was 98 percent. Both metals are crystalline, varying in shape from crystallites to clusters of dendritic hexagonal needles in the size range from 147 to less than 44 microns for the tungsten metal. All the molybdenum metal is less than 44 microns.

Representative scheelite concentrates from California were selected for investigation with two objectives in mind. First, to determine the lower limits of the grade of scheelite that could be economically treated by fused-bath electrolysis, and secondly, to determine the best electrolyte composition for treating these materials. Initial investigations of the scheelite followed the procedure used so successfully on Nevada scheelite (Report of Investigations 5554), but impurities found in the codeposited molybdenum and tungsten indicated a difference in the

mineralogy of the California and Nevada scheelites. Research toward developing a suitable electrolyte and to eliminate or minimize the contaminations in deposited metal continued during the remainder of the year with encouraging results.

Utilization of Anorthosite. Extensive studies on the lime-soda-sinter process of extracting alumina from aluminum silicates have been made by the Bureau of Mines. Current Bureau research is geared to learning the chemistry of the lime-soda-sinter process in greater detail. This cooperative research is designed to develop technology for utilizing the extensive reserves of anorthosite rock from the San Gabriel Mountains, Los Angeles County, as a source of alumina and possibly other mineral products.

Basically, the lime-soda-sinter process for recovering alumina from aluminum silicates involves mixing the ore with sufficient limestone and soda ash so that upon sintering, a mixture of dicalcium silicate and sodium aluminate will be formed. The sodium aluminate is soluble, while the dicalcium silicate is insoluble in caustic solutions. Upon separating the liquor from the insoluble residue, the alumina may be recovered by precipitation from the leach liquor. Initial small laboratory leach tests on sinter made from San Gabriel anorthosite have shown alumina recoveries in the range of 80 to 90 percent. A leach test on a large batch of sinter resulted in much lower alumina recovery. At the close of the fiscal year June 30, 1960, research was in progress to correct or minimize the gelation that caused the relatively high loss.

Slope Stability in Open Pits. Most of the Bureau's mining research being accomplished at various localities in the nation will be of value to California mine operators, but of immediate interest is the work in the Kramer Borate District, Kern County. The objective of this cooperative research is the establishment of the physico-mechanical properties data on the burden, sodium borate, and the footwall materials in the district's mines. The data and criteria so acquired will be applicable in designing mines and devising operational procedures effecting maximum, safe extraction of sodium borate minerals and hence materially helping conserve this great natural resource.

The Kramer District now is the source of about 60 percent of the world's annual supply of borate minerals. Demand for borate minerals is rapidly expanding and the reserve minable by current open-pit procedures is limited. Therefore, the mining of deeply buried parts of the deposit by improved open-pit or by underground methods is being considered.

From the standpoint of both safety and economy, assuring stability of the wall slopes in open pits two or more times as deep as current operations would be a serious problem. The extraction of 35 percent or less of the borate materials by the room-and-pillar method is ruinously low so the development of methods whereby nearly 100 percent extraction could be safely and economically achieved is of prime and pressing importance.

The research program is directed toward acquiring definite information which can be applied to predict accurately the manner in which the ore or inclosing formations will react when subjected to the strains induced by a specific type of mine operation conducted at various

depths where thickness of cover may range from 500 to over 1,000 feet. Research accomplished to date is in the categories of developing compressive strength and shear strength data on the borate burden materials, and the fabrication and installation of instruments for recording rebound resulting from unloading by removal of burden materials.

Department of Mineral Technology, University of California

An allocation of $5,000 was made by the Division of Mines in fiscal year 1960-61 to the Department of Mineral Technology, University of California, for cooperative testing and research on clay and other ceramic raw materials in furtherance of Division clay investigations.

Map and Manuscript Purchase Program

Each year a portion of the Division's budget ($7,200 in fiscal 1960-61) is allocated to purchase of maps and manuscripts that meet the Division's standards and fit into its programs. This policy not only encourages many college students to complete graduate research programs that would otherwise be difficult for them to achieve, but also it makes a great deal of useful information available in the Division files at relatively small expense. Some of this material may later be published in separate reports; some may be included in the State and other geological maps; some may be placed on open file for general information.

Besides these more tangible benefits, the program entails considerable intangible value in maintaining liaison and in furthering cooperation between the Division and all of the colleges and universities of the state that carry on research in the field of the mineral industry.

Manuscripts and maps purchased 1959-60.

Title	Author	Affiliation	Ms.	Map
Geology of Gazelle limestone	Churkin, Michael, Jr.	U.C.	X	X
Geology of eastern Clark mountain	Clary, Michael R.	U.S.C.	X	X
Pliocene in Los Angeles basin	Conrey, Bert L.	U.S.C.	X	
Geology of Langley Hill-Waterman Gap area, Santa Cruz Mountains	Cummings, Jon C.	Stanford		X
Geology of Ben Lomond quadrangle	Dibblee, T. W., Jr.			X
Stratigraphy and geology of Church Creek area, Monterey County	Dickenson, W. R.	Stanford	X	X
Legal guide	Gilmore, Chas. L.	Cons.	X	
Geologic reconnaissance of parts of Almanor, Greenville, and Kettle Rock quadrangles	McMath, Vernon E.	U.C.L.A.		X
Bibliography of California geology	Terry, R. D.	U.S.C.	Cards	only
Minerals of California	Murdoch, Joseph	U.C.L.A.		
	Webb, R. W.	U.C. (Santa Barbara)	X	

Other Agencies

In addition to the more extensive and long-continuing co-operative programs briefly discussed above, the Division of Mines is constantly engaging in cooperative work, on short-term and informal basis, with many other agencies. A number of state agencies, for example, regularly call upon the division for information on local and regional geology where published data are not yet obtainable. In a few experimental

instances, the division has cooperated with the Division of Beaches and Parks in the preparation of popular guides to the geology of some of the state parks. The Division of Highways has cooperated very effectively in supplying test data on sand and gravel deposits that will be of value in the Division of Mines' statewide research program on sources of aggregates. With the U. S. Forest Service and the Bureau of Land Management, the Division has cooperated in matters of mining law, mineral leasing, and in preservation of rights to mineral location in areas of proposed land withdrawals.

The Division continues its cooperation on investigations of recent faults and earthquakes with the University of California Seismograph Station, U. S. Coast and Geodetic Survey, U. S. Geological Survey, Pacific Fire Rating Bureau, Earthquake Engineering Research Institute, and Stanford Research Institute. During 1959-60 active cooperative work was carried on with the American Association of Petroleum Geologists, its members, and various oil companies in preparation of a volume on the geology of oil and gas producing areas of northern California with field guides. There is long-standing cooperation with the California Academy of Sciences in minerals research and exhibits.

F. Summary and Recommendations

Summary

Although the overall value of the State's mineral production has declined somewhat, owing mainly to a recession in the petroleum industry, there was an increase in 1959 both in amount and value, compared to 1958, for 14 mineral commodities, the great majority of these being nonmetals. Equally encouraging is the fact that exploration for new mineral resources continues very active both on the part of in-state and out-of-state interests.

California, in April 1960, established another "first" in the United States in the way of mineral resource development, with the successful harnessing of geothermal power to an electric generating station of the Pacific Gas & Electric Company at The Geysers in Lake County. Indications were increasing, through the year, that an important asbestos industry might soon become established within the State.

The Division, in 1959-60, continued its long time record of successful accomplishment, notably in the field of publications and maps. Three more sheets of the new State geologic map were brought out, Santa Cruz, San Luis Obispo and Santa Maria, bringing the total to five. (Death Valley and Alturas, the first in this new series, were published last year). The three newly issued sheets make a contiguous sequence in a central portion of the Coast Ranges and thus provide an unequalled pattern of the regional geology of a large area that has considerable potential for petroleum, for metallic and for nonmetallic minerals.

Despite the severity of competition for technical personnel, the Division was successful in retaining virtually all of its technical staff, except for losses due to retirement. And the turn-over rate for other classes remained gratifyingly low. Progress was made—albeit somewhat more slowly than had originally been hoped—in obtaining geochemists to fill the two positions authorized in the research program augmentation. Some 15 persons were selected from a nationwide list of applicants, as eligible for a civil service examination given almost

at the close of the fiscal year. Appointments will be delayed pending further oral examinations and the provision of suitable laboratory facilities.

Recommendations

It is perhaps an inevitable concomitant of all large organizations that progress comes slowly. The citizens of California very properly require that there be numerous checks and balances which must be satisfied before any significant new development can be initiated, or any change instituted. Therefore it is not to be anticipated that recommendations, however soundly based, made in any one year will see progress (much less fulfillment!) in an immediately succeeding year. And if recommendations made in a preceding year have been soundly based, then it is important that their status be reviewed before any further recommendations are considered.

At this point, therefore, a brief statement on each of the seven recommendations presented in the 110th Annual Report, is in order:

Basic Mapping. Progress has been made on the 1:250,000 scale State Map. The rate is largely determined by availability of base maps provided through the Corps of Engineers—hence this is a matter largely beyond control or recommendation of the Division. Mapping of 15′ quadrangles of selected areas, carried forward principally through the cooperative mapping program with the U.S. Geological Survey, needs to be increased—if California is to have satisfactory coverage within a reasonable period. Plans should be drawn which will provide this coverage, within say twenty years, by stepping up the cooperative program, and by initiating more mapping of this type on the part of Division personnel.

Space. The problem of adequate housing for the San Francisco headquarters of the Division, especially for housing of a modern mineralogical and geochemical research laboratory, is still perhaps the number one problem for the Division. During the year, however, with cooperation of our Department Headquarters, of our Ferry Building landlord (the San Francisco Port Authority), of the State Mining Board, and of the Department of Finance, plans have progressed to the point that it now appears that housing in a remodeled south wing of the Ferry Building can be made economically available—perhaps even within the coming fiscal year. Meantime, the Division must continue to push this toward a successful completion if the research program in particular, as well as other facets of the Division's work, are not to suffer undue delays.

The problem of whether and where it may be desirable to establish additional branch offices is obviously not one for which a solution should be attempted during the current "recession", but it is one that deserves careful consideration in order to be ready—promptly and efficiently—to serve the expanding mineral economy which is envisaged for the future.

Mineral Commodity Investigation. In last year's report the need was emphasized for mapping and research, particularly in connection with certain of the industrial minerals. The lack of laboratory facilities and of technical manpower that could be assigned to such a program was pointed out. These needs still exist, along with the need, also indi-

cated in the preceding report, for a mineral economist or economic analyst. Plans are under way for State-wide surveys of such important resources as clay, diatomite, limestone and sand and gravel. But with the very limited staff currently available for these investigations, completion of such studies is going to be much further in the future than either the Division or the State's mineral industries would like to see.

State Geophysical Anomaly Map. Attention was drawn, in last year's report, to the great desirability of publishing a state map which would include and would interpret some of the considerable amount of geophysical data that could be made available from a variety of sources. The importance of such a map, as an adjunct to the new State geologic map, is inestimable. Obviously, such a map cannot be prepared without the services of a geophysicist, and it may be far along in the coming year before a scientist, qualified in this special discipline, can be added to our staff. And it should be recognized that one geophysicist, without considerable technical assistance, will be in no position to bring out a map that is already needed, short of many years. To speed the preparation of such a map, as well as to take further advantage of what geophysics can do for the mineral industry, additional staffing in this field is necessary.

Urban Geologic Mapping. Only brief attention was given, in last year's recommendations, to the need for geologic mapping on a scale and of a type designed to provide city and county planners a basis not only for determination of "geologic hazards" (e.g. landslides, foundation problems, etc.) but also for estimation and for preservation (from unduly restrictive zoning requirements) of present and potential mineral resources, especially sand and gravel—commodities so necessary in themselves for urban development. The large-scale geologic map should indeed be basic for solution of many of the growing problems of "metropolitanization" with which California must increasingly contend.

Late in the year the Division initiated, in a small way, a "pilot study" of a selected area which will provide opportunity to assess the value of this type of mapping. Only by temporarily diverting one member of our technical staff from an important mineral commodity investigation has it been possible to initiate this pilot study. Any considerable program in mapping of urban and suburban areas must call for additional staff—preferably experienced in large-scale mapping and in evaluation of surficial geology.

Aerial Photo Coverage. Attention needs again to be called to the very great desirability of establishing a file which will provide complete air photo coverage of the State. Not only are air photos indispensable for almost all types of geologic mapping, they also can be of considerable assistance in almost any problem where terrain considerations enter. Funds are needed both to purchase the photos (the Division's files are currently only about 5 percent complete) and to provide the files and for a filing clerk in order that the photos can have maximum usefulness both for the public and for the Division staff.

Offshore Investigations. In the preceding report, the importance both of the sea and of the sea-bottom, off the California coast, as an actual and as a potential locus of mineral resources, was emphasized.

That the need for basic studies of our offshore areas—studies upon which the development of "marine" mineral resources will ultimately depend—is by no means visionary is attested to by the increasing attention, at the national level, that is being given to oceanographic research. In order properly to share in the benefits of Federal research, as well as to focus attention on California, the State needs to devote thought and effort to her off-shore heritage. To accomplish this requires specialized scientific manpower, and it is high time that addition of one or two "sea-going geologists" or oceanographers to the Division staff should be considered.

Core Library. The seven preceding items constitute a resume of the recommendations initiated a year ago. Important as the Division feels each of these to be for the future mining and mineral welfare of the state, an at least equally important need has recently been brought into focus and deserves urgent recommendation. This calls for the establishment of a well-sample and core "library," or core repository, which would preserve, codify, and make available for state-wide benefit, the vast amount of valuable "third-dimensional data" which currently is largely inaccessible to the interested public, and upon which future prospecting and mineral resources development must inevitably and increasingly depend. Initially, it is to be hoped that the petroleum companies, as a result of their drilling and coring programs, would contribute the bulk of the "accessions" to the "library"; but the library eventually should make provision for accession of the great amount of material that could be made available from mining companies, engineering organizations, and other public agencies—much of which is currently inadequately catalogued or preserved, with the result that valuable information and specimen material, which could have been retained at relatively little cost, is lost forever.

Virtually all of the leading counterpart organizations in other states have long since established, or are in process of establishing, such files and repositories. The value of sample libraries is therefore a demonstrable fact. California must not lag behind in such a worthwhile endeavor. Accordingly the Division urgently recommends that, as a very minimum, a feasibility study be authorized, looking toward the establishment of a modern sample library.

APPENDIX

Public Resources Code: Authority for Operation of the Division of Mines

The State Mineralogist (Chief, Division of Mines), State Mining Board, and the Director, Department of Natural Resources, derive their authority for operating the Division of Mines, determining its policies, and administering its activities from the State Public Resources Code. Pertinent sections (numbered) of that Code are quoted as follows:

Mineral Resources

"2205. The State Mineralogist shall:

"(a) Make, facilitate, and encourage special studies of the mineral resources and mineral industries of the State.

"(b) Collect statistics concerning the occurrence and production of the economically important minerals and the methods pursued in making their valuable constituents available for commercial use . . .

"2207. The owner, lessor, lessee, agent, manager, or other person in charge of any mine of whatever kind or character within the State shall forward to the State Mineralogist, upon his request, at his office, not later than the thirty-first day of March in each year, upon forms which will be furnished, a report showing the character of the mine, the method of working the mine and the general condition thereof, and the total mineral production for the preceding calendar year. Any such person who fails to comply with the provision of this section is guilty of a misdemeanor.

"Such reports shall be confidential. Other reports are public records unless excepted by the statute. Statistical bulletins based on these reports and published under the provisions of Section 2205 of this code shall be compiled to show, for the State as a whole and separately for each county, the total of each mineral produced therein, provided that, in order not to disclose the production of any operator, no production figure shall be published which represents the production of less than three operators; and when such production figure for any county would conflict with such provision it may be combined with such production figures for one or more other counties. Such bulletins shall be published annually by June 30th or as soon thereafter as practical."

Administration

"2201. The State Mineralogist shall employ competent geologists, field assistants, qualified specialists, and office employees when necessary in the execution of the plans and operations of the division under this chapter.

"2202. The State Mineralogist shall maintain offices, and a museum, library, and laboratory in San Francisco for the purposes provided in this chapter.

"2205. The State Mineralogist shall:

"(a) Make, facilitate, and encourage special studies of the mineral resources and mineral industries of the State.

"(g) Maintain, in effect, a bureau of information concerning the mineral industry of the State . . ."

State Mining Board

"507.1. State Mining Board: Members: Appointment: Qualifications: Incumbent members: Filling vacancies: Confirmation of appointments: Organizations: Powers: Appointment of employees of Division of Mines. There shall be a State Mining Board, consisting of five members appointed by the Governor with the advice and consent of the Senate for terms of four years and until their successors are appointed and qualified. Members shall be selected from those citizens of this State associated with or having detailed knowledge of the prospecting for, production, processing or marketing of the minerals of this State.

"The members of the incumbent Mining Board, continued in office, shall be classified by the Governor so that the term of office of one member shall expire January 15, 1950 and the terms of two members on January 15, 1951 and January 15, 1952, respectively. An appointment to fill a vacancy occurring before the expiration of a term shall be only for the remainder of that term. All appointments made when the Legislature is not in session shall be subject to confirmation at the next regular or special session of the Legislature. The board shall have power to organize itself and select its officers.

"The board shall represent the State's interest in the development, utilization and conservation of the mineral resources of the State. It is empowered to establish policies conforming to the provisions of state statutes to govern the administration of the Division of Mines.

"The director may authorize the State Mineralogist to exercise his power to appoint employees of the Division of Mines in accordance with the State Civil Service Act. The director may authorize the State Mineralogist or any employee of the Division of Mines to exercise any power granted or perform any duty imposed upon the director by the State Civil Service Act. (Added by Stats. 1949, Ch. 1081, Sec. 2.)"

Ore Buyers' Inspection

"2250. It is unlawful for any person to engage in the business of milling, sampling, concentrating, reducing, refining, purchasing, or receiving for sale, ores, concentrates, or amalgams bearing gold or silver, gold dust, gold or silver bullion, nuggets, or specimens without first procuring the license provided for by this chapter.

"2253. The application for a license to carry on such business shall be made to the State Mineralogist. . .

"2267. Every licensee under this chapter shall file monthly with the State Mineralogist a report of all purchases made under this chapter. The reports shall be made upon forms prescribed by the State Mineralogist and shall contain the information required by this chapter."

Mining Activities

"2208. The State Mineralogist or a qualified assistant may at any time enter or examine any and all mines, quarries, wells, mills, reduction works, refining works, and other mineral properties or working plants in this State in order to gather data to comply with the provisions of this chapter."

Information, Laboratory, and Exhibits

"2202. The State Mineralogist shall maintain offices and a museum, library, and laboratory in San Francisco for the purposes provided in this chapter.

"2204. The State Mineralogist may receive on behalf of this State, for the use and benefit of the Division, gifts, bequests, devises, and legacies of real or other property and may use the same in accordance with the wishes of donors. If no instructions are given by the donors, the State Mineralogist shall manage, use, and dispose of the gifts, bequests, and legacies for the best interest of the Division and in such manner as he may deem proper.

"2205. The State Mineralogist shall: . . .

"(c) Make a collection of typical geological and mineralogical specimens, especially those of economic and commercial importance, such collection constituting the museum of the division.

"(d) Provide a library of books, reports, and drawings bearing upon the mineral industries, the sciences of mineralogy and geology, and the arts of mining and metallurgy, such library constituting the library of the division.

"(e) Make a collection of models, drawings, and descriptions of the mechanical appliances used in mining and metallurgical processes.

"(f) Preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours.

"(g) Maintain, in effect, a bureau of information concerning the mineral industry of this State to consist of such collections and library, and arrange, classify, catalogue, and index the data therein contained, in a manner to make the information available to those desiring it.

"2206. The State Mineralogist may prepare a special collection of ores and minerals of California to be sent to or used at any world's fair or exposition in order to display the mineral wealth of the State."

Mineral Accessions

During the fiscal year, 1959-60, the Division of Mines accepted from many kind donors some interesting minerals and rocks. The following specimens were added to the mineral exhibits of the Division of Mines during the 1959-60 fiscal year:

21734 Pyrolusite (MnO_2), manganese dioxide. From Stella Maris mine, Casa Grande, Arizona. Donor: Orville K. Mills.

21735 Psilomelane ($BaMnMn_8O_{16}(OH)_4$), basic oxide of barium and manganese. From Stella Maris mine, Casa Grande, Arizona. Donor: Orville K. Mills.

21736 Tephroite ($Mn_2(SiO_4)$), manganese silicate. From Big Indian claim, Rand district, Kern County, California. Collector: Charles W. Chesterman.

21737 Lawsonite ($CaAl_2Si_2O_7(OH)_2 \cdot H_2O$), calcium aluminum silicate. From Buckeye Creek, Sonoma County, California. Donor: E. H. Bailey.

21738 Chromite ($FeCr_2O_4$), with green uvarovite and purple kammererite. From South Slope mine, Monterey County, California. Collector: Earl Hart.

21739 Haiweeite and metahaiweeite ($CaO \cdot 2UO_3 \cdot 6SiO_2 \cdot 5H_2O$), hydrated silicate of calcium and uranium. From near Haiwee Reservoir, Coso Mountains, Inyo County, California. Collector: Melvin C. Stinson.

21740 Selenite ($CaSO_4 \cdot 2H_2O$), hydrous calcium sulfate. From near Hollister, San Benito County, California. Donor: Rose Pavey.

21741 Coal. From Stone Canyon Coal Co. mine, Stone Canyon, Monterey County, California. Collector: Charles W. Jennings.

21742 Chrysotile asbestos ($H_4Mg_3Si_2O_9$), hydrous magnesium silicate. From Burro Asbestos prospect, Los Burros Creek, SW Monterey County, California. Collector: Earl W. Hart.

21743 Stibnite (Sb_2S_3), antimony trisulfide. From northeast corner of main dump, Sulphur Bank mine, Lake County, California. Donor: Roger C. Elsey.

21744 Metacinnabar (HgS), mercuric sulfide. From northeast corner of main dump, Sulphur Bank mine, Lake County, California. Donor: Roger C. Elsey.

21745 Cinnabar (HgS), mercuric sulfide. From Sulphur Bank mine, Lake County, California. Donor: Roger C. Elsey.

21746 Veatchite ($Sr_3B_{16}O_{27}\cdot 5H_2O$) (?), a hydrated strontium borate. From Sterling Borax mine, Lang, Los Angeles County, California. Collector: Wm. H. Nisson.

21747 Camptonite showing phenocrysts of kaersutite (titaniferous hornblende). From 7½ miles south of Hoover Dam on Kingman road, Mohave County, Arizona. Donor: Jack Craig.

21748 Kaersutite (titaniferous hornblende), in camptonite. From 7½ miles south of Hoover Dam on Kingman road, Mohave County, Arizona. Donor: Jack Craig.

21749 Minerals suitable for micromounts (pyrite, heulandite, phillipsite, calcite, erionite, and paulingite) from vesicles in basalt. Dredged from the bottom of the Columbia River when deepening the channel at the Rock Island Dam, 12 miles below Wenatchee, Washington. Donor: W. C. Oke.

21750 Artinite ($Mg_2(CO_3)(OH)_2\cdot 3H_2O$), hydrated basic carbonate of magnesium, with chrysotile on serpentine. From San Benito County. Donor: Herman Akers.

21751 Sanbornite ($Ba_2Si_4O_{10}$), barium silicate. From Big Creek mining district, Fresno County, California. Donor: Robert E. Walstrom.

21752 Antlerite ($Cu_3(SO_4)(OH)_4$), basic sulfate of copper. From Buchanan mine, near Knowles, Madera County, California. Donor: John Parnau.

21753 Boussingaultite ($(NH_4)_2Mg(SO_4)_2\cdot 6H_2O$), hydrated sulfate of ammonium and magnesium. From The Geysers, Sonoma County, California. Donor: R. M. Philips.

21754 Chrome diopside ($CaMgSi_2O_6$), calcium magnesium silicate contaning chromium. Fresno County, California. Donor: Warren Hughes.

21775 Uvarovite ($3CaO\cdot Cr_2O_3\cdot 3SiO_2$) calcium chrome garnet, and violet kammererite ($H_8(Mg,Fe)_5Al_2Si_3O_8$) chrome chlorite on chromite. From San Benito County, California. Donor: Herman Akers.

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PHOTO 3. Members of Sacramento Geological Society inspecting the unconformity between the basal conglomerate (dark) of the Neroly formation of upper Miocene age and the underlying Panoche formation of Upper Cretaceous age.

CALIFORNIA MINERAL COMMODITIES IN 1959

By Fenelon F. Davis *

OUTLINE OF REPORT

	Page
Production of mineral commodities in California during 1959	79
Mineral commodities of California during 1959	83
Asbestos	83
Barite	83
Boron minerals	84
Bromine	84
Calcium chloride	84
Cement	84
Chromite	86
Clay	86
Coal	87
Copper	87
Diatomite	88
Feldspar	88
Gem stones and mineral specimens	88
Gold	89
Granite (see stone)	
Gypsum	91
Iodine	91
Iron ore	91
Lead	95
Lime	95
Limestone	96
Lithium salts	96
Magnesite	96
Magnesium salts	96
Manganese ore	97
Mercury	97
Natural gas	98
Natural gas liquids	98
Peat	99
Perlite	99
Petroleum	100
Platinum	103
Potash	103
Pumice, pumicite, and volcanic cinders	103
Pyrite	103
Quicksilver (see mercury)	
Rare earth minerals	103
Salt	104
Sand and gravel	105
Silica	105
Silver	105
Slate	106
Sodium carbonate	106
Sodium sulfate	106
Stone	107
Sulfur	108
Talc, soapstone, and pyrophyllite	108
Tungsten	109
Uranium	109
Wollastonite	109
Zinc	109
Mineral production in the counties of California during 1959	109

* Mining Geologolist, California Division of Mines. Manuscript submitted for publication December 1960.

Illustrations

		Page
Photo 1.	Cement-copper installation at the Penn copper mines, Campo Seco, Calaveras County	79
Photo 2.	Aerial view of Eagle Mountain iron mine, Riverside County	92
Photo 3.	Blasting at the Eagle Mountain iron mine, Riverside County	94
Photo 4.	Workings of the Fredanna (Little King) mercury mine, Kings County	98
Photo 5.	Ore treatment plant at the Mount Jackson mercury mine, Sonoma County	99
Photo 6.	View of steam wells at The Geysers, Sonoma County	100
Photo 7.	Offshore oil-drilling platform, Summerland, Santa Barbara County	101
Figure 1.	Chart showing California mineral commodity production, 1959	81
Figure 2.	Mineral production trends	82
Figure 3.	Diagrammatic sketch of iron ore concentrating process	93

PRODUCTION OF MINERAL COMMODITIES IN CALIFORNIA DURING 1959

The decline in California mineral production, which began in 1958, after seven years of successive increases (1951 to 1957 inclusive), continued into 1959. The total value of production in 1959 was $1,424,000,000 (rounded) down 5 percent from the $1,500,000,000 (rounded) value reported in 1958. Still, the 1959 value was the sixth highest in the state's history, falling slightly below that recorded in 1954. Production during the past 12 years has, each year, exceeded the billion dollar mark. These were the post war years of population growth and industrial expansion in California.

Table 1. California's billion dollar production years (1948-1959).

1948	$1,146,411,000	1954	1,431,103,193
1949	1,074,416,000	1955	1,458,729,633
1950	1,056,047,000	1956	1,551,524,133
1951	1,209,428,000	1957	1,650,035,000
1952	1,219,425,901	1958	1,500,367,000
1953	1,392,796,687	1959	$1,424,179,000

A more cheery production note was registered in 1959 by the industrial minerals group (which includes all non-metallic minerals except fuels). The production in this group, composed of construction materials (cement, clay, gypsum, lime, sand and gravel, stone, etc.) and minerals useful in industrial processes (borates, diatomite, magnesium compounds, salt, salines, talc, etc.) has been advancing steadily for the

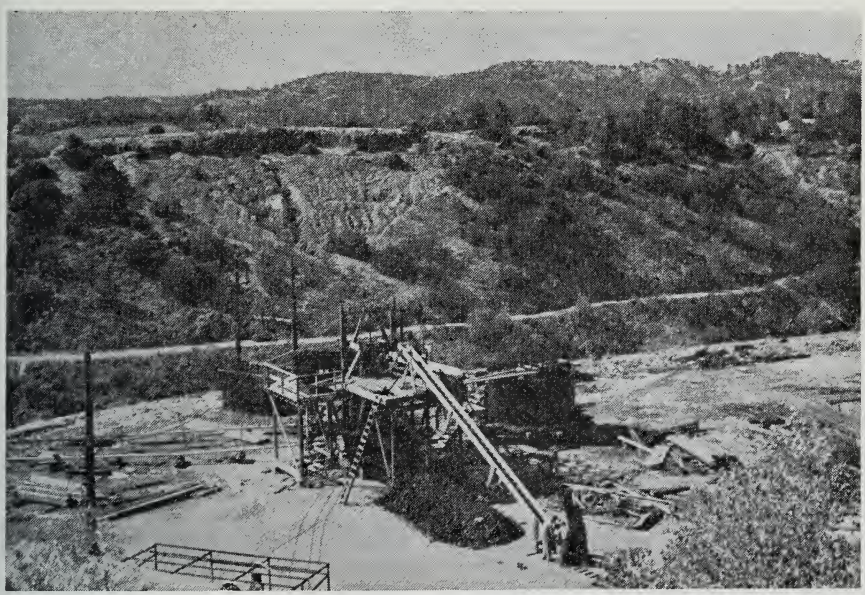


PHOTO 1. Installation of equipment to treat copper-bearing water from the number 5 shaft at the Penn mine, Campo Seco, Calaveras County. The mine waters were directed over scrap iron for the recovery of cement copper.

Table 2. California mineral production in 1959.

Mineral commodity	Quantity	Value
Barite	28,143 short tons	$326,000
Borates	619,946 short tons	46,150,000
Cement	43,635,526 barrels	138,506,000
Clay	2,082,853 short tons	*5,023,539
Copper	1,326,000 pounds	407,000
Feldspar	76,489 long tons	783,000
Gem stones	----	150,000
Gold	146,141 troy ounces	5,115,000
Gypsum	1,686,000 short tons	3,788,000
Lead	454,000 pounds	52,000
Lime	357,668 short tons	5,817,000
Magnesium compounds from sea water (MgO equivalent)	87,968 short tons	6,336,000
Manganese ore, concentrates (35% + Mn)	19,354 short tons	1,663,000
Manganese ore, (35% — Mn)	129 short tons	2,876
Mercury	17,100 flasks	3,890,000
Natural gas	488,664,000 M cubic feet	114,152,000
Natural gas liquids, natural gasoline and cycle products	834,258,000 gallons	68,023,000
Liquefied petroleum gases	396,331,000 gallons	21,260,000
Peat	34,604 short tons	449,000
Petroleum	308,946,000 barrels	783,684,000
Pumice, pumicite and volcanic cinders	574,000 short tons	2,162,000
Salt	1,388,000 short tons	----
Sand and gravel	87,944,973 short tons	108,909,000
Silver	172,902 troy ounces	156,000
Stone	20,719,382 short tons	*37,863,739
Talc	148,266 short tons	1,500,000
Zinc	156,000 pounds	18,000
Unapportioned**	----	73,394,000
Total value (rounded)	----	$1,424,179,000

* Does not include clay sold or used in cement, and limestone used in lime and cement.

** Includes asbestos, bromine, calcium chloride, carbon dioxide, chromite, coal, diatomite, iodine, iron ore, lithium salts, magnesite, molybdenum concentrates, perlite, platinum, potash, pyrite, rare earth minerals, sodium carbonate, sodium sulfate, strontium minerals, sulfur ore, tungsten concentrates, uranium ore and wollastonite.

past two decades (1939-1959). During this period the value of production in the industrial minerals group has risen from 14 percent of the state total to 28 percent. The year 1959 was no exception as the total value of the group registered an increase of 4 percent over 1958. Seven group members reached all-time highs in quantity and value of production: borates, cement, diatomite, gypsum, lime, magnesium compounds, sand and gravel. This apparently is part of a long-term trend and bids fair to continue concurrently with population growth and expansion of industry. Industrial mineral production in the past 12 years is tabulated below.

Table 3. Value of industrial minerals produced in California, 1948-1959.

1948	$153,978,000	1954	266,976,000
1949	146,394,000	1955	283,920,000
1950	187,751,000	1956	349,401,000
1951	204,561,000	1957	351,149,000
1952	202,078,000	1958	356,434,000
1953	232,071,000	1959	$400,875,000

The value of production in the metals group declined for the third successive year. Production in 1959 was $35,597,000 (rounded), off 7 percent from the comparative figure of $38,166,000 reported in 1958.

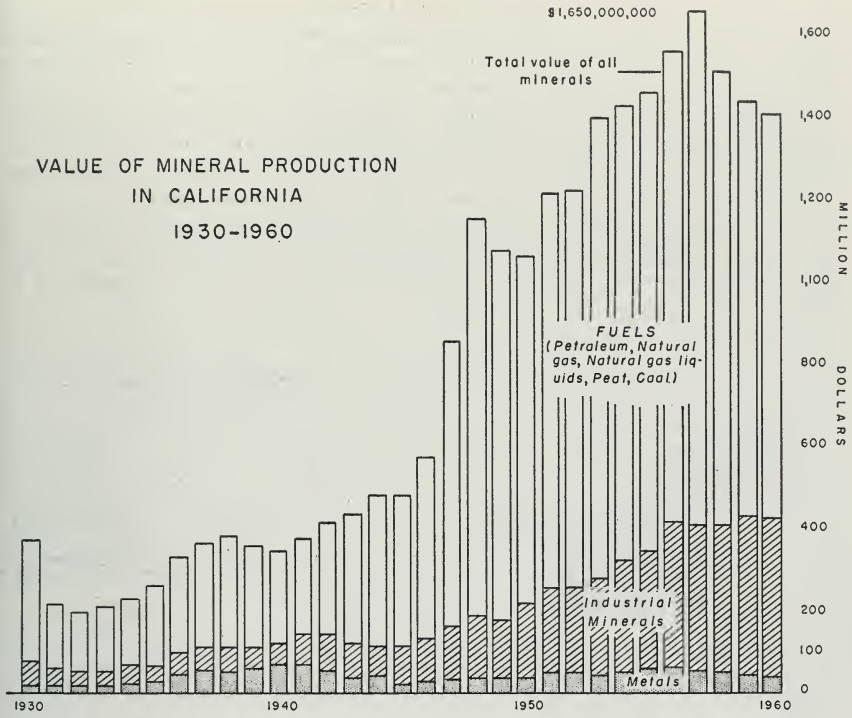


Figure 1

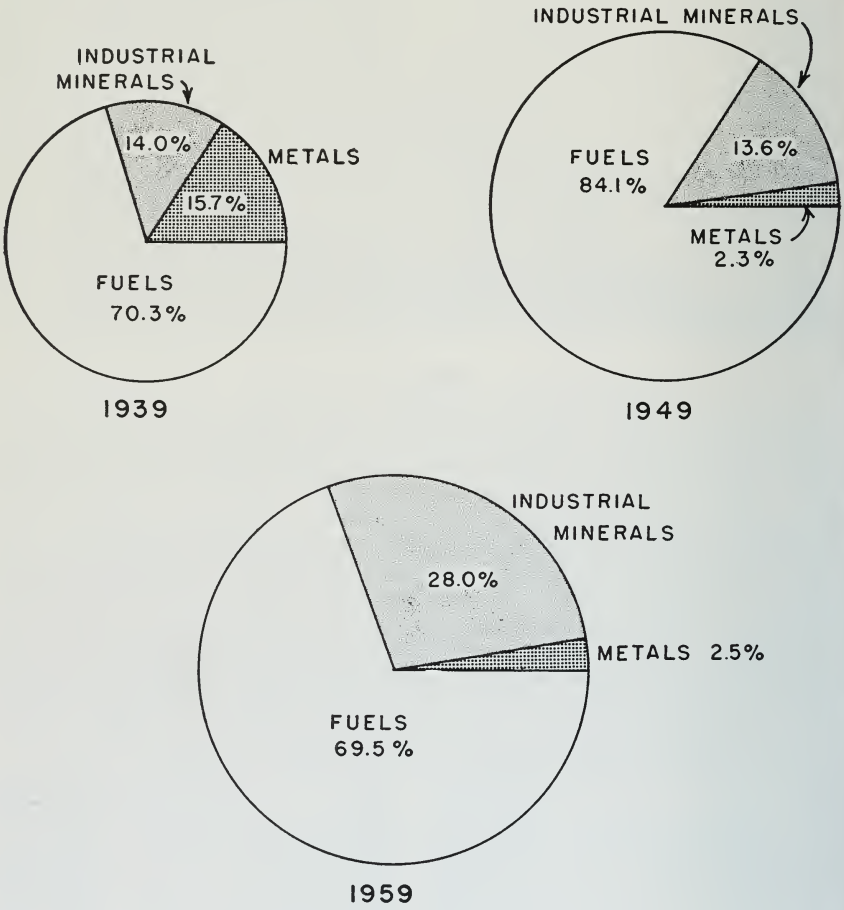
Metals and metallic ore production constituted only $2\frac{1}{2}$ percent of the state's total value of all mineral commodities, whereas twenty years ago the metals group accounted for 16 percent of the total value. Thus, during the past two decades the metals group contribution to the state total has declined percentagewise by almost the same amount gained by the industrial minerals group. Since the dollar value of the metals group production remained in the same general area during the 20-year interval, it illustrates how one can lose ground by standing still. The big blow to the metals was, of course, the closing of the gold mines with the advent of World War II in 1942. As a result of the closing

Table 4. Value of metals produced in California, 1948-1959.

Year	Value	Year	Value
1948	$25,275,000	1954	41,666,000
1949	25,031,000	1955	51,413,000
1950	27,168,000	1956	55,804,000
1951	42,873,000	1957	43,982,000
1952	43,016,000	1958	38,166,000
1953	39,581,000	1959	35,597,000

edict, gold production dropped from $49 million to $5 million in two years (1941 to 1943), a blow from which neither the group as a whole nor the gold mines have yet recovered. The value of metals group production in the post war period is presented in table 4.

The value of production in the fuels group also declined for the third successive year. Although the decline in quantity and unit price of crude petroleum production was partly offset by increased production of natural gas as the area of new dry gas fields was extended, nevertheless, the group value was off about 10 percent compared to 1958. In 1959 mineral fuels represented 69 percent of the state's total value. The value of fuels production in the post-war period is presented in table 5.



RELATIVE MINERAL PRODUCTION, 1939,1949 AND 1959

Figure 2

Table 5. Value of fuels produced in California, 1948-1959.

Year	Value	Year	Value
1948	$967,158,000	1954	1,112,217,000
1949	902,991,000	1955	1,115,168,000
1950	841,128,000	1956	1,138,773,000
1951	961,994,000	1957	1,254,904,000
1952	969,776,000	1958	1,105,767,000
1953	1,121,145,000	1959	$987,704,000

MINERAL COMMODITIES OF CALIFORNIA DURING 1959

Asbestos

Exploration for asbestos was intensive in California during 1959. Although asbestos production here has been negligible, the recent industrial boom on the West Coast has created expanded markets for short-fiber chrysotile, a commodity presently imported from eastern Canada at considerable cost in freight alone. The result, of course, is an attractive, growing, local market for asbestos from California deposits. Recognizing this situation, the Division of Mines began a study of asbestos deposits in the state several years ago, and has been instrumental in stimulating the recent exploration activity.

Considerable prospecting for asbestos was done at a unique deposit northwest of Coalinga in Fresno and San Benito Counties. Here a large volume of serpentine has been sheared and altered to produce a flaky mixture of chrysotile and talc, locally called mountain leather. The Union Carbide Nuclear Co. staked a large number of claims on this deposit in western Fresno and San Benito Counties. Extensive location work was done, drill tests were made and bulk samples were shipped east for mill tests.

The Jefferson Lake Sulfur Co., Houston, Texas, extensively explored the Voorhies chrysotile asbestos deposit near Copperopolis, Calaveras County. Drill cores were shipped to Quebec for evaluation of mill runs. On this basis the company purchased the property and has expressed its intention to construct a 2000-ton mill at the mine site.

Meanwhile, the only chrysotile production came from a short-fiber deposit in Steel Canyon, Napa County. The fiber was processed at a mill near the mine and was used as a filler in magnesia block and pipe covering to increase the strength of the former and the heat insulation properties of the latter. The quantity and value of production in 1959 showed a small increase over 1958.

Although no production of amphibole asbestos was reported in 1959, it is estimated that a token production was made from a deposit in Shasta County. In the past this material has been used as a filler and fire-retardant in paints.

Barite

Barite production (sold or used) increased from 24,812 short tons valued at $271,766 in 1958, to 28,143 short tons valued at $326,301 in 1959. Actual production in 1959 totaled 31,019 short tons and originated from three properties located in Nevada, San Bernardino and Tulare Counties. Stocks were increased by 2,876 short tons.

Small quantities of ground barite were used in the glass, rubber, and paint industries and in asphalt emulsions. In the paint and rubber industry the material was used as filler, and as ballast for tractor tires.

Crude barite consumption in California increased from 43,292 short tons in 1958 to 70,763 short tons in 1959. The deficiency between California consumption and production was balanced by imports from other states, principally Nevada.

Borates

Deposits in the Mojave Desert of southeastern California supply about 90 percent of the world's demand for boron minerals. During 1959 Pacific Coast Borax continued to mine sodium borates from its new, large open pit in the Kramer District of eastern Kern County. The same company also produced colemanite, a calcium borate, from mines southeast of Death Valley, near Shoshone, Inyo County.

A substantial quantity of borates was recovered from the interstitial brines of the crystal salt bodies of Searles Dry Lake in northwestern San Bernardino County by companies operating wells and chemical plants at Trona and Westend.

During 1959, California shipments of boron minerals totaled 619,946 short tons, containing 314,286 short tons of B_2O_3 valued at $46,149,928, compared with 528,209 short tons containing 265,613 short tons of B_2O_3 valued at $38,309,915. The 1959 production figures were all-time highs.

Bromine

Bromine production in California is a co-product of the chemical separation of raw materials at plants in Alameda and San Bernardino Counties. At the Alameda plant, the salt-bittern residue from the solar evaporation of sea water on San Francisco Bay is the source of bromine. In the San Bernardino County plant, bromine is recovered from the brines produced by wells drilled into Searles Dry Lake. The annual California production of bromine averages about 2 percent of the total output in the United States.

The quantity and value of bromine produced in California during 1959 was less than that reported for 1958. Although bromine in the U. S. is consumed chiefly in the preparation of ethylene dibromide for anti-knock gasoline, all of the bromine produced in California is used for such purposes as grain and soil fumigants.

Calcium Chloride

Calcium chloride has been recovered from the brines of Bristol Lake since 1910, and all present production is from this source. The quantity and value of calcium chloride sold by producers in 1959 were below the figures reported in 1958. Calcium chloride is also known to be present in the brines of Bristol and Cadiz Dry Lakes in San Bernardino County, in the brines of certain Ventura County oil wells, and in an artesian well on Mullet Island, Imperial County.

Cement

Since California ranks first among the states in consumption of cement and second in its production, cement-making is well established as a principal component of the mineral industry in the state. Although crude minerals for the manufacture of cement are generally plentiful, suitable deposits relatively near the principal marketing centers of Los Angeles and San Francisco are none too plentiful. Owing to con-

tinuing growth in population and the resulting industrial expansion California output has increased considerably in the post-war period.

The upward trend in cement production which was resumed in 1958 continued into 1959 with modernization and plant expansion still in evidence. Ideal Cement Company plant at San Juan Bautista, San Benito County, which had been placed on a stand-by basis in 1958, was reopened early in 1959. At Oro Grande in San Bernardino County, the Riverside Division of American Cement Company spent $6,000,000 in modernization by the installation of a new automatic crushing, blending, and rock storage facility. The selection of raw materials was accelerated by the use of a process control digital computer. Two large rotary kilns were installed to replace five small obsolete kilns on the property.

The Calaveras Cement Division of Flintkote acquired a limestone deposit and plant site 12 miles northeast of Redding, and announced plans to build a new plant in that area. The raw material will be mined from the McCloud limestone of Permian age. Ample supplies of clay-shale for cement are also available. A southern California cement company acquired an inactive clay and limestone deposit at Volcano in Amador County. A limestone deposit south of Sonora was optioned and test drilled by an industrial consumer.

The quantity and value of cement shipments reached an all-time high in 1959. Cement sold and used totaled 43,635,526 barrels valued at $138,506,000, compared to 93,583,433 barrels valued at $124,367,339 in 1958. The five northern California mills contributed 18,063,328 barrels worth $58,873,287, and the eight southern California mills 25,572,-198 barrels worth $79,632,705 in 1959, compared to 17,281,381 barrels worth $54,307,087 and 22,302,052 barrels worth $70,060,252, respectively, in 1958.

Cement production (all types) in 1959 totaled 43,634,278 barrels compared to 39,056,288 barrels in 1958—most of which was sold and used. The northern mills (in Calaveras, San Benito, San Mateo, Santa Clara and Santa Cruz Counties) produced 17,929,550 barrels in 1959, compared to 16,829,200 barrels in 1958. The southern mills (Kern 2, Los Angeles, Riverside and San Bernardino 4) produced 25,704,728 barrels in 1959, compared to 22,227,088 barrels in 1958.

The average mill price of cement in California in 1959 was $3.17 per barrel compared with $3.14 per barrel in 1958.

The five northern California mills used a total of 386,912,729 kilowatt hours of electrical energy, while the eight southern California mills used a total of 613,062,424 kilowatt hours of electrical energy in 1959.

The annual capacity of the 81 cement kilns in all California cement mills was 51,605,000 barrels as of December 31, 1959. The capacity of the 28 northern kilns was 18,735,000 barrels and of the 50 southern kilns was 32,870,000 barrels.

Although some of the California cement is shipped in paper bags, most of the cement is shipped in bulk. The 1959 figures were 7,253,279 barrels and 36,382,247 barrels respectively, compared to 6,984,743 barrels and 32,598,690 barrels respectively in 1958. Of the 1959 bulk shipments 25,999,072 barrels were shipped by truck and 9,321,954 barrels

Table 6. Raw materials used in portland cement in California.
Short tons

	1959	1958
Cement rock	*	*
Limestone	11,414,618	9,947,618
Oyster shells	*	*
Shale	321,792	214,722
Clay	490,049	432,696
Sand	*	*
Sandstone	*	*
Gypsum	349,445	312,990
Fluorspar	*	*
Iron ore	52,850	47,945
Mill scale Pyrite sinter	71,769	54,234
Air-entraining compounds	*	*
Grinding aids	*	*

* Consumption statistics not available.

were shipped by railroad. In addition, some shipments were made by ship and some bulk cement was used locally at the mills. Of the bag shipments 6,195,377 barrels went by truck, 1,055,350 barrels went by railroad, and 2,552 barrels were used locally at mills.

Table 7. Shipments of portland cement by types (barrels).

	1959	1958
Types I & II (General use—moderate heat)	41,943,095	38,301,279
Type III (High early strength)	198,238	242,839
Type IV (Low heat)	*	*
Type V (High sulfate resistance)	82,318	116,215
Oil Well	116,560	99,976
White	*	*
Puzzolon	*	*
Waterproof	761,586	403,170
Other	482,813	384,742
Used at mills	20,303	26,501

* Not available.

Chromite

Chromite deposits are widely distributed through the serpentine and peridotite rocks of the Klamath Mountains, Coast Ranges and foothills of the Sierra Nevada. California mines cannot compete successfully with foreign sources of chromite during normal times but our deposits constitute a valuable reserve to be mined during periods of national emergency or at any time when ore prices are sufficient to cover mining costs.

Upon completion of the U.S. Government Emergency Procurement Services stockpile program in May 1958, all chrome mining in California ceased. No production was made in 1959, but a small shipment was made from the previous production at the Lambert mine in Butte County. The material was ground and used in the manufacture of glass containers.

Clay

Clay ranked sixteenth in value of mineral products produced in California in 1959. Common clay is mined in California from flood plain and alluvial deposits of Recent age and from Mesozoic shale. Production is centered near the metropolitan areas, chiefly San Francisco and Los

Angeles. Fire clay is mined from residual and sedimentary deposits of Eocene age along the western foothills of the Sierra Nevada and the northern part of the Santa Ana Mountains. Bentonitic clay is produced chiefly from the Mojave Desert Region of southeastern California.

Crude clay produced in California in 1959 totaled 2,725,994 short tons valued at $5,645,710, compared with 2,393,763 short tons valued at $5,012,319 in 1958. Of the 1959 production 643,141 tons valued at $622,171 were used in the manufacture of cement, while 2,082,853 tons valued at $5,023,539 were used by the ceramic industry and other consumers of clay. Eighty-three producing pits in 28 counties contributed to the 1959 production, compared to 89 pits in 29 counties during 1958.

Included in the above figures for 1959 were 436,493 short tons of fire clay valued at $1,568,247; 10,289 short tons of bentonite and fuller's earth valued at $144,597; and 12,959 short tons of kaolin and china clay valued at $203,028. The remainder of the production consisted of brick clay, ball clay, red-burning clay-shale, oil well drilling mud, etc.

Most of the kaolin and china clay was used in white ware and as filler in paper, paint and plaster products. The ball clay was used entirely in wall and floor tile. The fire clay was used in fire brick and heavy clay products (building brick, drain tile, sewer pipe and kindred products). The bentonite was used in foundries, rotary drilling-mud, filters, and in products valuable for their trace-element content. The fuller's earth was used as a filler in insecticides and fungicides and as a filtering agent for animal, vegetable and mineral oils. Most of the common clay was used in heavy clay products with a small percentage going into art pottery, flower pots and glaze slip.

Coal

Flat-lying, lens-shaped bodies of lignite occur in a series of clay, shale, and sandstone beds comprising the Ione formation of middle (?) Eocene age. The Ione formation is exposed in isolated patches along the western foothills of the Sierra Nevada. Its lignite content is particularly high near Ione, Amador County.

The coal mined in California during 1959 came from a single property in Amador County. It was the lignite variety and was not used as a fuel but as a source of montan wax, vandyke brown, and humic acid. The montan wax is used as an insulator in electric cable, in polishes, and as a substitute for carnauba wax in phonograph records, candles, and waterproof paints and varnishes. The vandyke brown was used as a pigment in shoe polishes and the humic acid was used as a soil additive.

Copper

Chalcopyrite has been the chief copper mineral in the commercial copper deposits of California. Pyrite, pyrrhotite and iron-bearing sphalerite are generally associated with the copper ore. The depletion of developed mine reserves during World War II, high operating costs, and the necessity for shipping copper ore and concentrates to out-of-state smelters, account for the relative inactivity in California copper mines during recent years.

The Pine Creek tungsten mine in the high Sierra of Inyo County continued to be the largest copper producer in the state. Here, chal-

copyrite, molybdenite and scheelite are produced as co-products from the tungsten ore.

The Copper Bluff mine on the Hoopa Indian Reservation in Humboldt County produced a small quantity of copper ore which was concentrated in a flotation plant near the mine. The Jesse Belle mine in Madera County also produced a small quantity of copper ore which was floated to produce a copper concentrate. A small quantity of cement copper was recovered from mine waters at Iron Mountain, Shasta County, by the Mountain Copper Co. Ltd.

The copper produced in California in 1959 totaled 1,326,000 pounds valued at $407,082 compared to 1,498,000 pounds valued at $393,974 in 1958.

Diatomite

California diatomite of potential commercial importance is found either in marine sedimentary rocks of Miocene and Pliocene age, or in fresh-water lake beds of Tertiary and Quaternary age. Most of the production in the state thus far has come from marine rocks.

The diatomite produced in 1959 reached an all-time high in both quantity and value. Production was made from marine deposits near Lompoc, Santa Barbara County, and near Buttonwillow, Kern County; and from fresh-water beds near Napa, in Napa County.

In general about 46 percent of the production was used in filter aids; 25 per cent in fillers; 6 percent in insulation; and 23 percent in miscellaneous outlets (including abrasives, admix in concrete, and manufacture of lightweight concrete aggregates).

Feldspar

During 1959 most of the feldspar was produced from the beach sands near Pacific Grove, Monterey County. The material produced is a mixture of potash and soda-lime feldspar and is separated from the crude beach sand by flotation. (The silica fraction of the sand was used in the glass industry.)

The feldspar was ground and the quantity and value of the product were slightly in excess of those recorded in 1958. Most of the ground feldspar was used in coating sanitary ware, while small quantities were used in pottery and in the glass industry.

Fluorspar

A small tonnage of fluorspar was shipped from the mine of the Pacific Fluorite Company in San Bernardino County in 1958. No production was reported in 1959.

Gem Stones and Mineral Specimens

Gem stones are rare mineral natural materials of unusual beauty and durability. They may be classed as precious stones, semi-precious stones, and organic materials. The semi-precious gem stones are quite numerous and generally are relatively rare varieties of common minerals.

The production of semi-precious gem stones in California is somewhat irregular and uncertain. Each year, however, small quantities of semi-precious gem stones are collected or produced by mineral

Table 8. Semi-precious gem stones and mineral specimens reported from California localities during 1959.

County	*Minerals*
Calaveras	Agate, opalized wood.
Humboldt	Agate, jasper.
Imperial	Agate, jasper, dumortierite, kyanite, quartzite, garnets, chalcedony.
Inyo	Quartz crystals, dendritic agate, jasper, onyx, travertine, geodes.
Kern	Agate, jasper, petrified wood, rhodonite, obsidian, howlite, palm root fossils.
Los Angeles	Agate, jasper, bloodstone, sagenites, geodes, howlite, thompsonite.
Mendocino	Prehenite.
Modoc	Obsidian.
Monterey	Jade, rhodonite, agate, jasper.
Napa	Onyx (chalcedony).
Riverside	Agate, crystals, idiocrase.
San Benito	Jadeite, benitoite, selenite.
San Bernardino	Agate, jasper, petrified palm, common opal, rhodonite, verde antique, marble, bloodstone, hematite, onyx marble, petrified wood, blue agate, chalcedony, travertine.
San Diego	Tourmaline, spessartite garnet, quartz crystals.
San Luis Obispo	Marcasite in agate, sagenite agate, aragonite crystals.
Santa Barbara	Jasper, meta-chert, whale bone.
Santa Clara	Jasper, agate, magnesite, geodes, myrichite.
Santa Cruz	Fossil whale bone.
Siskiyou	Agate, rhodonite, vesuvianite.
Sonoma	Jasper.
Tuolumne	Petrified wood, mariposite, quartz, tourmaline, soapstone.

dealers, hobbyists, and amateur lapidarists at widely scattered localities throughout the state.

An estimated value of $150,000 has been placed on the precious gem stones and mineral specimens reported during 1959 from the localities listed in table 8.

Gold

Gold production was at the lowest point since 1944 owing chiefly to the curtailment of bucketline dredging operations along the flood plain of the American River in Sacramento County. The Natomas Company continued to diversify its activities by entering fields other than gold mining where a greater return on capital investment can be realized. Three bucketline dredges of the Yuba Consolidated Gold Fields continue to produce placer gold from the lower Yuba River in Yuba County. Roy S. Olson operated a dragline dredge intermittently southwest of Redding when water was available.

Two lode gold mines in the Downieville-Alleghany area of Sierra County (the Brush Creek mine and the 16-to-1 mines) formed the bastion of the last outpost of underground gold-mines in California. Mining at the Hazel Creek mine in El Dorado County was curtailed by a fire which destroyed the mill during the early part of the year. The mill at the Siskon open-pit lode gold mine continued to cyanide gold ore previously stockpiled between the Florida and Tennessee pits.

The near-term outlook for low-grade underground gold mining may be indicated by the sale of the surface properties of the Idaho Maryland mines in Grass Valley for a home subdivision; and the auction

Table 9. Annual quantity and value of gold produced in California, 1848-1959.

(Figures from 1903-23 prepared by U. S. Geological Survey; 1924-59, by U. S. Bureau of Mines. Values calculated on the following bases: 1848-1932, inclusive, average weighted price of $20.6718 per fine oz.; 1933, average weighted price of $25.56 per fine oz.; 1934, average weighted price of $34.95 per fine oz.; 1935-59, $35.00 per fine oz.)

Year	Fine ounces	Value	Year	Fine ounces	Value
1848	11,866	$245,301	1905	914,217	18,898,545
1849	491,072	10,151,360	1906	906,182	18,732,452
1850	1,996,586	41,273,106	1907	809,214	16,727,928
1851	3,673,512	75,938,232	1908	907,590	18,761,559
1852	3,932,631	81,294,700	1909	979,007	20,237,870
1853	3,270,803	67,613,487	1910	953,734	19,715,440
1854	3,358,867	69,433,931	1911	954,870	19,738,908
1855	2,684,106	55,485,395	1912	953,640	19,713,478
1856	2,782,018	57,509,411	1913	987,187	20,406,958
1857	2,110,513	43,628,172	1914	999,113	20,653,496
1858	2,253,846	46,591,140	1915	1,085,646	22,442,296
1859	2,217,829	45,846,599	1916	1,035,745	21,410,741
1860	2,133,104	44,095,163	1917	971,733	20,087,504
1861	2,026,187	41,884,995	1918	799,588	16,528,953
1862	1,879,595	38,854,668	1919	807,667	16,695,955
1863	1,136,897	23,501,736	1920	692,297	14,311,043
1864	1,164,455	24,071,423	1921	759,721	15,704,822
1865	867,405	17,930,858	1922	709,678	14,670,346
1866	828,367	17,123,867	1923	647,210	13,379,013
1867	883,591	18,265,452	1924	636,140	13,150,175
1868	849,265	17,555,867	1925	632,035	13,065,330
1869	881,830	18,229,044	1926	576,798	11,923,481
1870	844,537	17,458,133	1927	564,586	11,671,018
1871	845,493	17,477,885	1928	521,740	10,785,315
1872	748,951	15,482,194	1929	412,479	8,526,703
1873	726,554	15,019,210	1930	457,200	9,451,162
1874	835,186	17,264,836	1931	523,135	10,814,162
1875	816,377	16,876,009	1932	569,167	11,765,726
1876	735,169	15,610,723	1933	613,579	15,683,075
1877	798,249	16,501,268	1934	719,064	25,131,284
1878	911,343	18,839,141	1935	890,430	31,165,050
1879	949,439	19,626,654	1936	1,077,442	37,710,470
1880	968,986	20,030,761	1937	1,174,578	41,110,230
1881	929,920	19,223,155	1938	1,311,129	45,889,515
1882	829,458	17,146,416	1939	1,435,264	50,234,240
1883	1,176,329	24,316,873	1940	1,455,671	50,948,485
1884	657,900	13,600,000	1941	1,408,793	49,307,755
1885	612,478	12,661,044	1942	847,997	29,679,895
1886	711,911	14,716,506	1943	148,328	5,191,480
1887	657,349	13,588,614	1944	117,373	4,108,055
1888	616,000	12,750,000	1945	147,938	5,177,830
1889	542,425	11,212,913	1946	356,824	12,488,840
1890	595,486	12,309,793	1947	431,415	15,099,525
1891	615,759	12,728,869	1948	421,473	14,751,555
1892	608,166	12,571,900	1949	417,231	14,603,085
1893	606,664	12,538,780	1950	412,118	14,424,130
1894	670,636	13,863,282	1951	339,732	11,890,620
1895	741,798	15,334,317	1952	258,176	9,036,160
1896	831,158	17,181,562	1953	234,591	8,210,685
1897	767,779	15,871,401	1954	237,886	8,326,010
1898	769,476	15,906,478	1955	251,737	8,810,795
1899	741,881	15,336,031	1956	193,816	6,783,560
1900	767,390	15,863,355	1957	170,885	5,980,975
1901	821,845	16,989,044	1958	185,385	6,488,475
1902	818,037	15,910,320	1959	146,141	5,114,935
1903	788,544	16,300,653			
1904	901,484	18,633,676	Totals	105,566,817	$2,396,582,796

sale of all equipment, including headframe and hoisting machinery, at the Empire Star mines in Grass Valley. These two were the last of the large, deep, underground lode gold mines worked in the state. Small-scale, intermittent gold prospecting and mining was noted in Alpine, Amador, Butte, Calaveras, Kern, Madera, Mariposa, Placer, Plumas, San Bernardino, Shasta, and Tuolumne Counties.

Production totaled 146,141 troy ounces valued at $5,114,935, compared with 185,385 troy ounces valued at $6,488,475 in 1958. Of this production 107,773 troy ounces valued at $3,772,055 were produced by placer mines, chiefly bucketline dredges in Yuba and Sacramento Counties; and 38,368 troy ounces valued at $1,342,880 were produced by lode mines, chiefly in Sierra, Siskiyou and Yuba Counties. Some production was reported by 42 placer mines and by 73 lode mines of various types. The ore sold or treated by the lode mines totaled 141,636 short tons, while the yardage washed by the placer mines totaled 24,864,683 cubic yards.

Gypsum

Rock gypsum was produced in California during 1959 from a Tertiary non-marine deposit in Imperial and Ventura Counties and from a deposit in Riverside County which occurs in slightly metamorphosed pre-Cretaceous rocks. In addition, Recent deposits of gypsite were mined along the southwest border of the San Joaquin Valley and from the Carrizo Plain in San Luis Obispo County.

The quantity and value of gypsum production in California in 1959 were at all-time high points. Production totaled 1,685,994 short tons valued at $3,788,028, compared to 1,423,060 short tons valued at $3,183,984 in 1958.

Slightly over half of the gypsum produced is calcined for use in various plaster products.

Uncalcined gypsum sold for agricultural use totaled 773,134 short tons valued at $1,286,810 in 1959. Most of the remainder of the uncalcined gypsum was used as a retarder in the manufacture of portland cement.

Iodine

All of the iodine produced in the United States is recovered from the brine that accompanies petroleum in certain oil fields of the Los Angeles basin. These are the Dominguez, Playa del Rey, Inglewood, and Seal Beach fields, all in Los Angeles County, except for a portion of the Seal Beach field, which extends into Orange County.

In 1959 the quantity of production increased slightly while the value of production dropped slightly compared to 1958.

Iron Ore

The iron ore deposits of the Eagle Mountains in Riverside County are replacement deposits of dolomite by magnetite, now partly altered to hematite. Although some direct-shipping ore averaging 56 percent iron is produced, most of the mined ore is sent through the concentrator where it is up-graded to about 57 percent iron.

Unhampered by weather conditions, the production of iron ore in 1959 continued at a pace slightly over that of 1958, despite the steel strike during the year. Most of the ore was produced at the Eagle

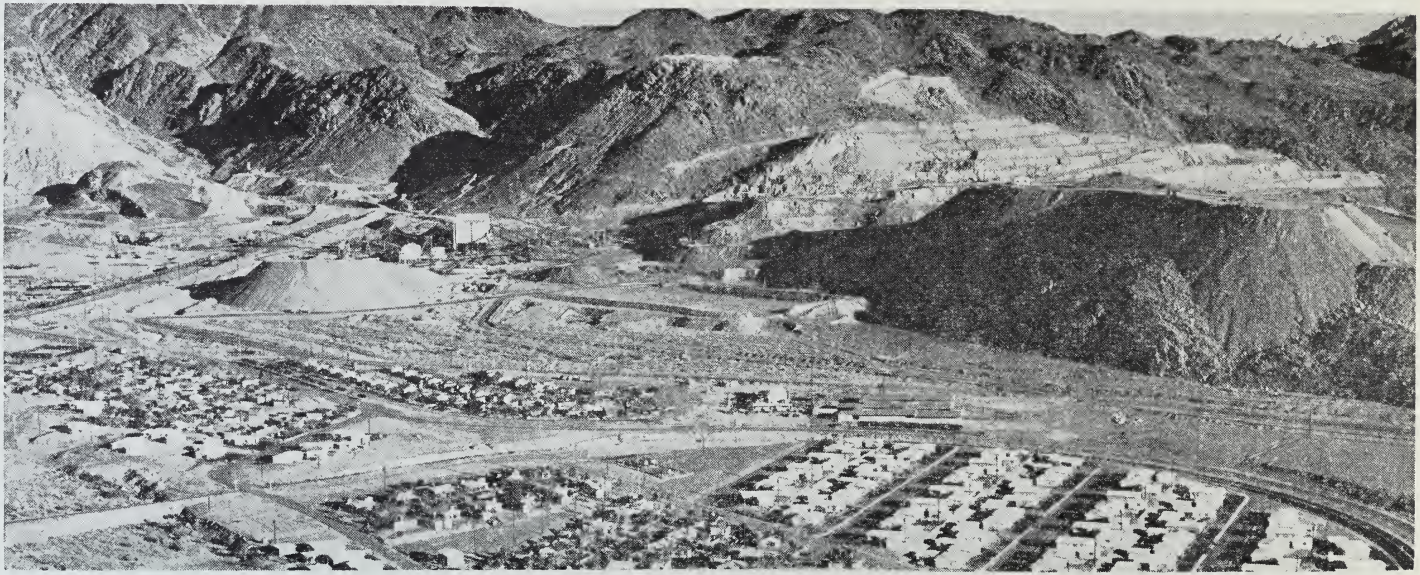


PHOTO 2. Aerial view of Kaiser Steel's Eagle Mountain iron mine in Riverside County shows: open cut mine (right center); new multi-million dollar ore concentrating plant (left center) where ore is upgraded before shipment to the steel mill in Fontana, San Bernardino County; company built homes (foreground) where families of 500 miners reside. *Photo courtesy Kaiser Steel Corporation.*

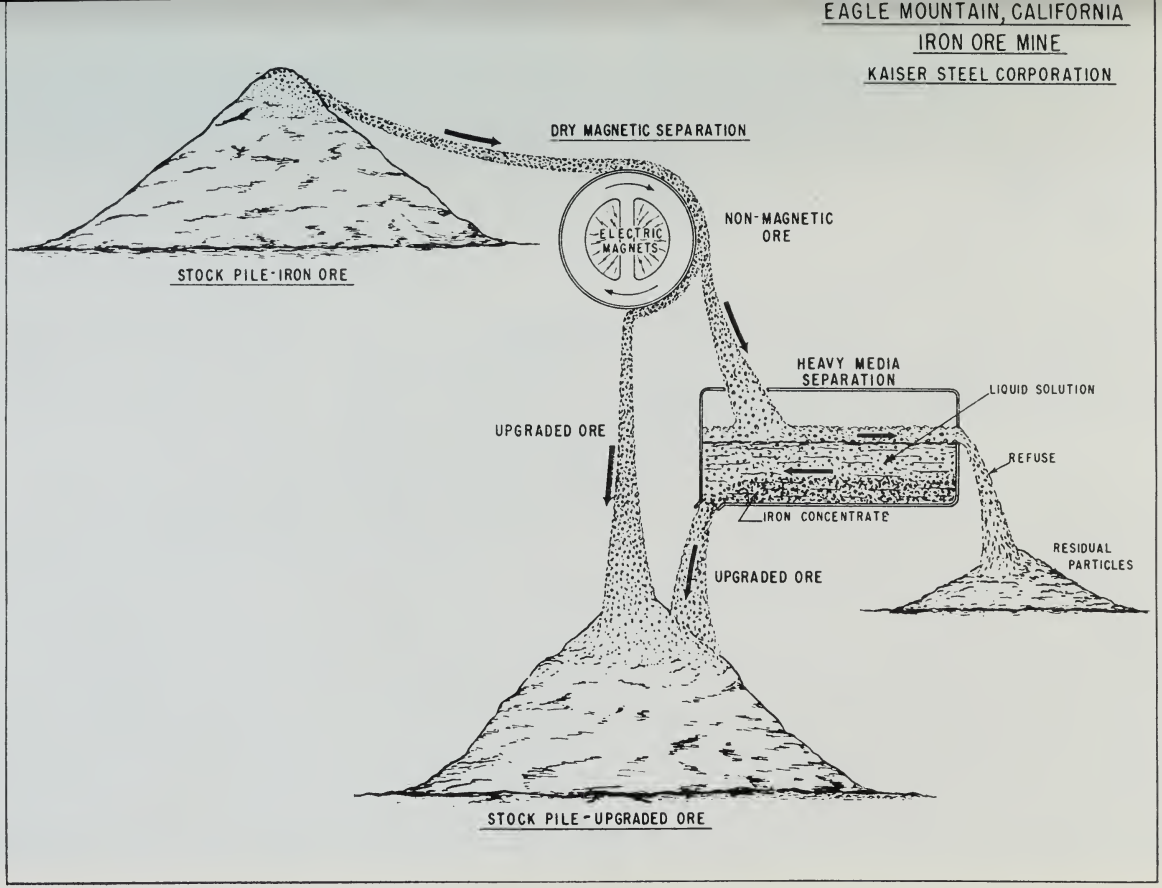


FIGURE 3. Flow chart indicating how present high-grade iron ore is further upgraded through a magnetic and heavy-media separation process at the Eagle Mountain iron mine. *Courtesy Kaiser Steel Corporation.*

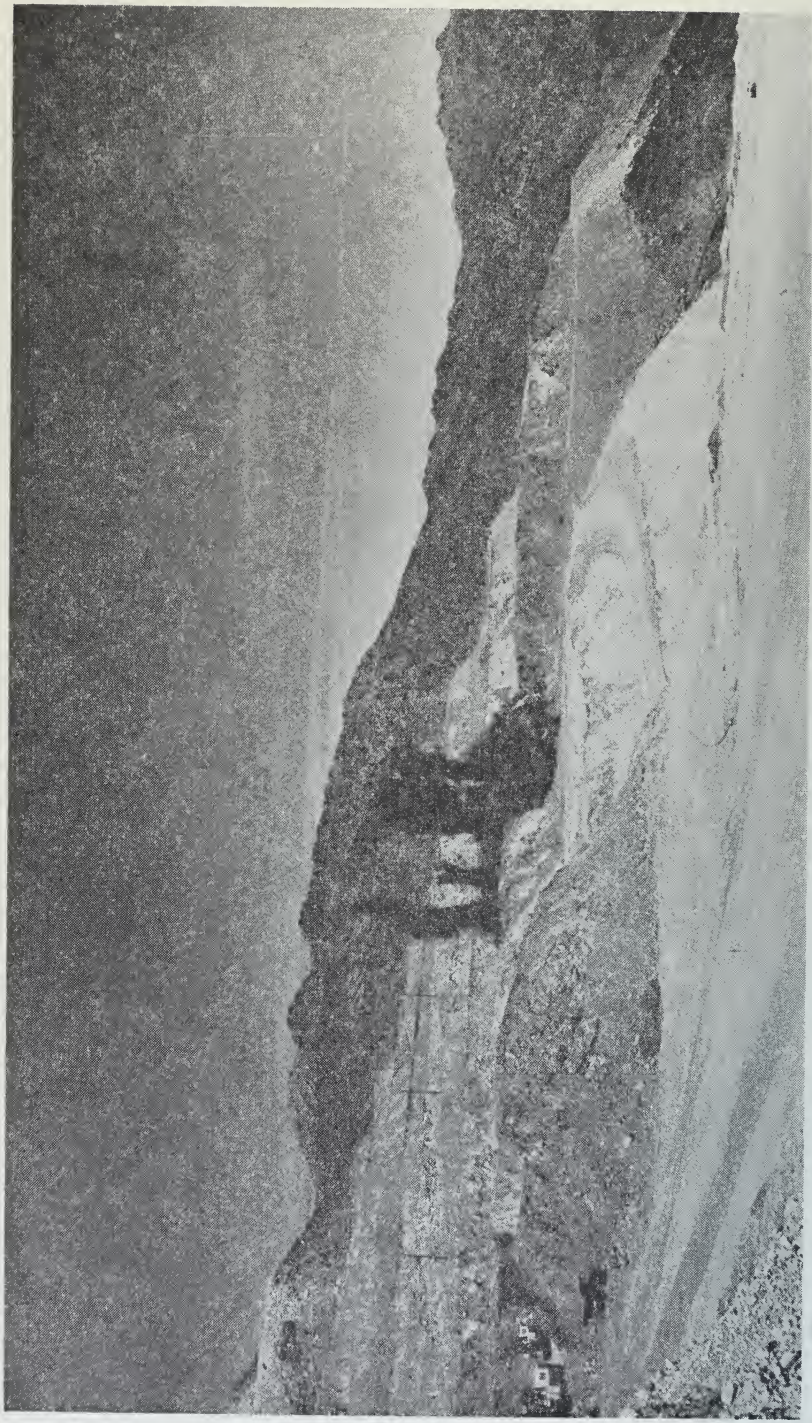


PHOTO 3. View of bench blasting at the North-South pit of the Eagle Mountain iron mine, Riverside County. *Photo courtesy Kaiser Steel Corporation.*

Mountain mine in Riverside County where mining efficiency was increased by employing larger and more efficient equipment which had been introduced during the previous year. The ore mined in Riverside County was shipped to the Kaiser steel mills at Fontana.

The ore mined from the Iron Age deposit in San Bernardino County was shipped to cement mills to be used in the manufacture of high-iron, low heat cement. This type of cement is used in dams and other massive structures to minimize cracking from internal thermal stress during the setting period. It provides the second largest outlet for California iron ore.

Lead

The lead ore shipped to smelters during 1959 was mined chiefly from the Santa Rosa, Defense and Queen of Sheba mines in Inyo County. Other small producing lead mines were in Inyo and San Bernardino Counties.

Gold mines in El Dorado, Mariposa, Nevada and Shasta Counties, a tungsten mine in Inyo County and a copper mine in Shasta County also produced extremely small quantities of co-product lead.

The recoverable lead produced from these ores totaled 454,000 pounds valued at $52,210, compared to 280,000 pounds valued at $32,760 in 1958.

The large lead mines in the Darwin District of Inyo County closed about mid-year 1957 when the price of lead dropped to 10¼ cents per pound. The average price during 1959 was 12¢ per pound (New York).

Lime

The output of lime (sold and used) in California in 1959 totaled 357,668 short tons valued at $5,817,367, compared with 261,807 short tons valued at $4,469,723 in 1958. The lime burned in 1959 came from rotary kilns of two companies in San Bernardino County and one company in each of the following counties: Alameda, El Dorado, Monterey and Tuolumne. The company in Tuolumne County employed both rotary and vertical kilns. The lime produced in Monterey County was made from dolomite; dead-burned dolomite was also produced at this plant.

Of the total 1959 production, 315,893 short tons were quicklime and 41,775 short tons were hydrated lime, as compared to 223,705 short tons of quicklime and 38,102 short tons of hydrated lime in 1958.

Of the total 1959 production, 255,692 short tons of quicklime and 30,162 short tons of hydrated lime valued at $4,420,612 were used in the chemical industry, as compared to 155,952 short tons and 28,206 short tons, respectively in 1958; 48,397 short tons of quicklime valued at $968,786 were used in the refractory industry compared to 55,812 short tons valued at $1,080,738 in 1958; 11,797 short tons of quicklime and 10,564 short tons of hydrated lime valued at $405,691 were used in the building industry compared to 11,936 short tons and 8,513 short tons, respectively, in 1958; 7 short tons of quicklime and 1,049 short tons of hydrated lime valued at $22,278 were used in the agricultural industry compared to 5 short tons and 1,383 short tons, respectively, valued at $23,153 in 1958.

The average value of all lime sold or used in California in 1959 was $16.26 per short ton compared to $17.07 in 1958.

Limestone

The quantity and value of industrial limestone produced in 1959 increased to 2,442,658 short tons valued at $7,597,904, from 2,033,719 short tons valued at $6,049,311 (revised) reported in 1958. These figures do not include the limestone used in lime and cement.

Production in 1959 originated at quarries in El Dorado, Inyo, Mariposa, Monterey, Riverside, San Benito, San Bernardino, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Shasta, Tuolumne, and Ventura Counties. The material from Orange County and part of that from San Mateo and Santa Clara Counties was shells. The dolomite from San Benito County and some of that from Monterey, San Bernardino and Tuolumne Counties are included under the Stone section.

The quantity and value of oyster shells produced in California declined in 1959. Most of the shells were dredged from South San Francisco Bay within the confines of San Mateo and Santa Clara Counties. They were used in the preparation of cement, poultry grits and mineral foods.

Limestone or marble from Inyo, San Bernardino and Tuolumne Counties was produced and crushed, primarily for terrazzo chips and roofing granules. The quantity and value of production increased in 1959.

Lithium Salts

Lithium is a minor constituent in the brines of Searles Dry Lake and is recovered as dilithium sodium phosphate (Li_2NaPo_4) at the Trona plant of the American Potash & Chemical Corporation in northwestern San Bernardino County. The entire output is converted by the producer into lithium carbonate, from which lithium and lithium chemicals can be prepared. Lithium-bearing frits are used to make porcelain enamels in the ceramic industry. The quantity and value of dilithium sodium phosphate production increased in 1959 over that reported in 1958.

Magnesite

An extremely small tonnage of crude magnesite was mined from the Western mine on Red Mountain in Santa Clara County during 1959. The product was shipped to a chemical company in Alameda County. Production was considerably less than in 1958.

Magnesium Compounds

Chemical plants at Newark in Alameda County, Moss Landing in Monterey County and South San Francisco in San Mateo County, produce magnesium compounds from sea water or bitterns by treating them with calcined dolomite. A plant at Chula Vista, San Diego County, produces magnesium chloride from sea-water bitterns.

The plant in Alameda County on San Francisco Bay and the one on Monterey Bay produced a caustic magnesia compound and a dead-burned magnesia compound; the former compound was sold to the plastic and insulation trade while the latter was used in refractories for metallurgical plants. The plant in San Mateo County produced various magnesium compounds used in the drug and rubber trades; the plant in San Diego County produced magnesium chloride crystals.

Production of magnesium compounds (MgO equivalent) in 1959 totaled 87,968 short tons valued at $6,335,734, compared to 74,132 short tons valued at $4,853,874 in 1958.

Manganese Ore

Under the stimulus of an approaching deadline, the manganese mines made a concerted effort to produce ore and concentrates for the Government stockpile. About 82 percent of the production was high-grade shipping ore from the counties of Humboldt, Imperial, Kern, Lake, Mendocino, Plumas, Riverside, San Bernardino, San Luis Obispo, Stanislaus and Tehama. An all-time high in the dollar value of production was attained. Substantial shipments of ore were made from the new Queens Peak mine discovered in western Humboldt County late in 1958. As this deposit is outside the limits of previously known manganese districts, it opened up a new area for additional prospecting. The quota for the carlot program was completed in August, and since it left the domestic mines without a profitable market for their ore, the mines closed almost immediately.

Production in 1959 totaled 19,354 short tons of ore and concentrates with a manganese content of 35 percent or more, valued at $1,662,634. Production of similar ore and concentrates in 1958 totaled 17,644 short tons valued at $1,516,118. In addition, 129 short tons of low-grade manganese ore valued at $2,876 was produced in 1959.

Mercury

Mercury production, which had reached a 15-year high in 1958, dropped about 24 percent in 1959. Production totaled 17,100 flasks valued at $3,889,908, compared with 22,365 flasks valued at $5,122,927 in 1958. This drop was partly the result of depleted ore reserves at some mines, and expansion programs which interrupted regular production at others. The principal producing mines were: the New Idria, the Abbott, the Mt. Jackson, the Buena Vista, the New Almaden, and the Altoona.

The Mt. Jackson mine in Sonoma County sought to improve operating efficiency by replacing the old cage-car hoisting system with a modern 2-ton automatic dumping skip-cage. The latter loads from and dumps into ore pockets cut in the wall of the shaft. A steeply inclined winze was sunk from the bottom production level (1086′) to the 12-level, where drifting to the ore body was in progress. While previous core drilling has shown that the ore body extends well below the 12-level, it is expected that about one-third of the production will continue to be from stopes above the 10-level.

A U.S. Government (OME) exploration loan in the amount of $102,316 was granted in 1958 to Trans-Pacific Metals Co. for new work at the Reed mine in Yolo County. The exploration work continued on the surface near the north part of the property.

The price of mercury, which was relatively stable during the year, averaged $231 per flask in the first-half, but weakened to $215 per flask in mid-December. The yearly average was $227.48 per flask compared to $229.06 in 1958. The general outlook for the consumption of mercury is good owing to the constantly increasing demand for conventional uses and the emphasis on new technological developments for its use in the field of nuclear power.

PHOTO 4 (above). Workings of the Fredanna (Little King) mercury mine, Kings County, showing open cuts and adit portal (center) to underground workings.

Natural Gas

California produces both "dry" or marsh gas, and "wet" or oil-field gas. "Wet" gas, which is associated with petroleum and is produced at all oil fields, is high in "heavy" hydrocarbon content which may be profitably extracted at natural gasoline plants and sold as natural gas liquids. After extraction of these liquids the residue gas enters the natural gas supply. Most of the dry gas is produced in the Sacramento Valley of northern California where exploration drilling is constantly seeking new gas fields.

The natural gas produced in 1959 totaled 488,664,000 thousand cubic feet valued at $114,152,000, compared to 465,582 thousand cubic feet valued at $108,481,000 in 1958. In addition, 738,843,000 thousand cubic feet of natural gas were obtained from out-of-state sources.

Natural Gas Liquids

Natural gas liquids are liquid hydrocarbons obtained from natural gas by absorption and condensation. Included in this group are natural gasoline, cycle products, and liquefied petroleum gases. "Wet" natural gas is treated at plants near the oil fields to produce these products.

The natural gas gasoline and cycle products recovered in California during 1959 totaled 834,258,000 gallons valued at $68,023,000, compared with 853,045,000 gallons valued at $68,485,000 in 1958.

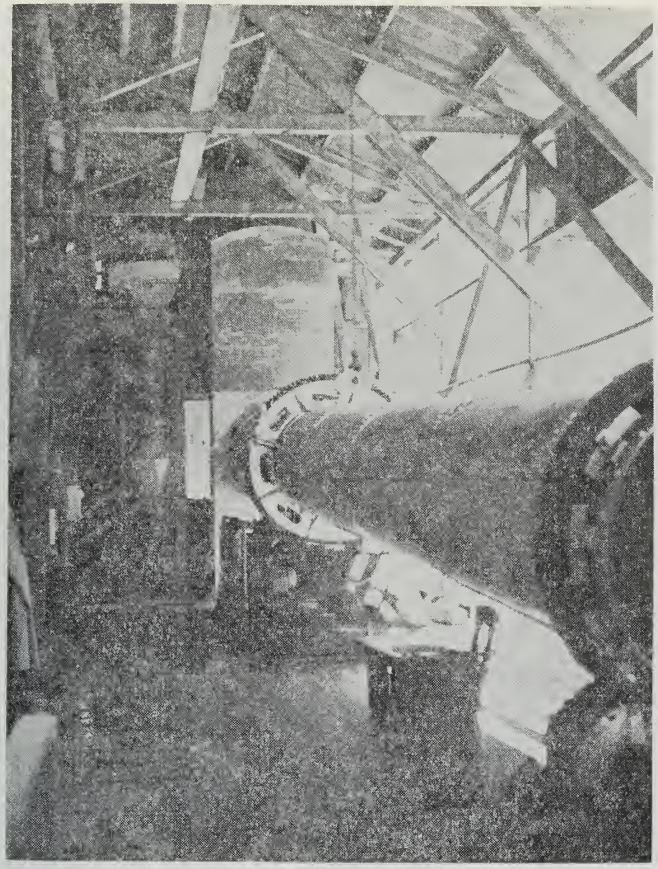


PHOTO 5. View along inclined rotary furnace at Mt. Jackson mercury mine, Sonoma County.

Liquefied petroleum gases recovered from natural gas treating plants in 1959 totaled 396,331,000 gallons valued at $21,260,000, compared with 342,992,000 gallons valued at $18,678,000 in 1958.

Peat

Although high grade peat moss is produced from a bog in Modoc County, most of the peat produced in California is reed and sedge peat or peat humus. Reed peat was produced from two properties in the Sacramento River Delta area of Contra Costa County. Peat humus was produced from two properties in a bog north of Huntington Beach, Orange County. During 1959 a new property in the Banning District of Riverside County was added to the production list for the first time.

The peat produced in 1959 totaled 34,604 short tons valued at $449,000, compared with 28,617 short tons valued at $373,743 in 1958. All the material produced was used as a mulch and soil conditioner.

Perlite

Crude perlite was produced from single properties in Inyo and Napa Counties during 1959. The expanded perlite sold or used totaled 23,235

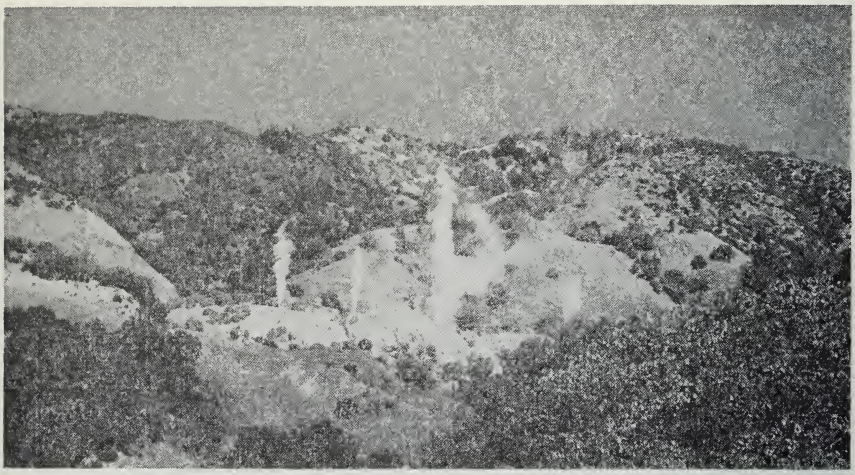


PHOTO 6. View northeastward looking across Big Sulfur Creek at the steam wells near The Geysers, Sonoma County. A plant was under construction in 1959 to harness the thermal energy of these wells for its conversion to electrical energy. This is the first time such a conversion was attempted in the United States. *Photo by Mary Hill.*

short tons valued at $1,422,052, compared to 22,210 short tons valued at $1,291,726 in 1958. The average value of the expanded perlite sold or used in 1959 was $61.20 per short ton compared to $58.16 in 1958. The weight per cubic foot of the expanded perlite ranged from 4.5 to 8.0 in 1959.

Nine expanding plants were operating in California during 1959. Six were located in Los Angeles County, one in Contra Costa, one in Napa and one in San Diego County. The expanded perlite was used in building plaster 13,469 short tons; as filter aids 3,557 short tons; in concrete (lightweight) aggregate 1,360 short tons; and for numerous other uses such as loose fill, insulation, soil conditioning, wall board, paint and fillers. Comparative use figures in 1958 were: 13,130, 3,343, 1,212, respectively.

Petroleum

Dollarwise, petroleum is still California's most important mineral product. Production, however, has been gradually declining since 1953 when an all-time peak rate of 1,000,000 barrels per day was reached. The quantity and value of petroleum production in 1959 declined for the sixth successive year. Production in 1959 was 308,946,000 barrels valued at $783,684,000, compared to 313,672,000 barrels valued at $909,649,000 in 1958.

During 1959 new wells drilled totaled 1527 compared to 1533 in 1958; deepening or redrilling of old wells totaled 1115 compared to 966; and wells abandoned totaled 881, compared to 728.*

Some interesting highlights of activity in the oilfields during the year included: An unproductive well to the depth of 15,978 feet was drilled at Lynwood, Los Angeles County. This was the deepest well ever drilled in the Los Angeles basin and was bottomed in sediments of basal Pliocene age. A second well was completed from the off-shore

* Data from California Division of Oil and Gas.

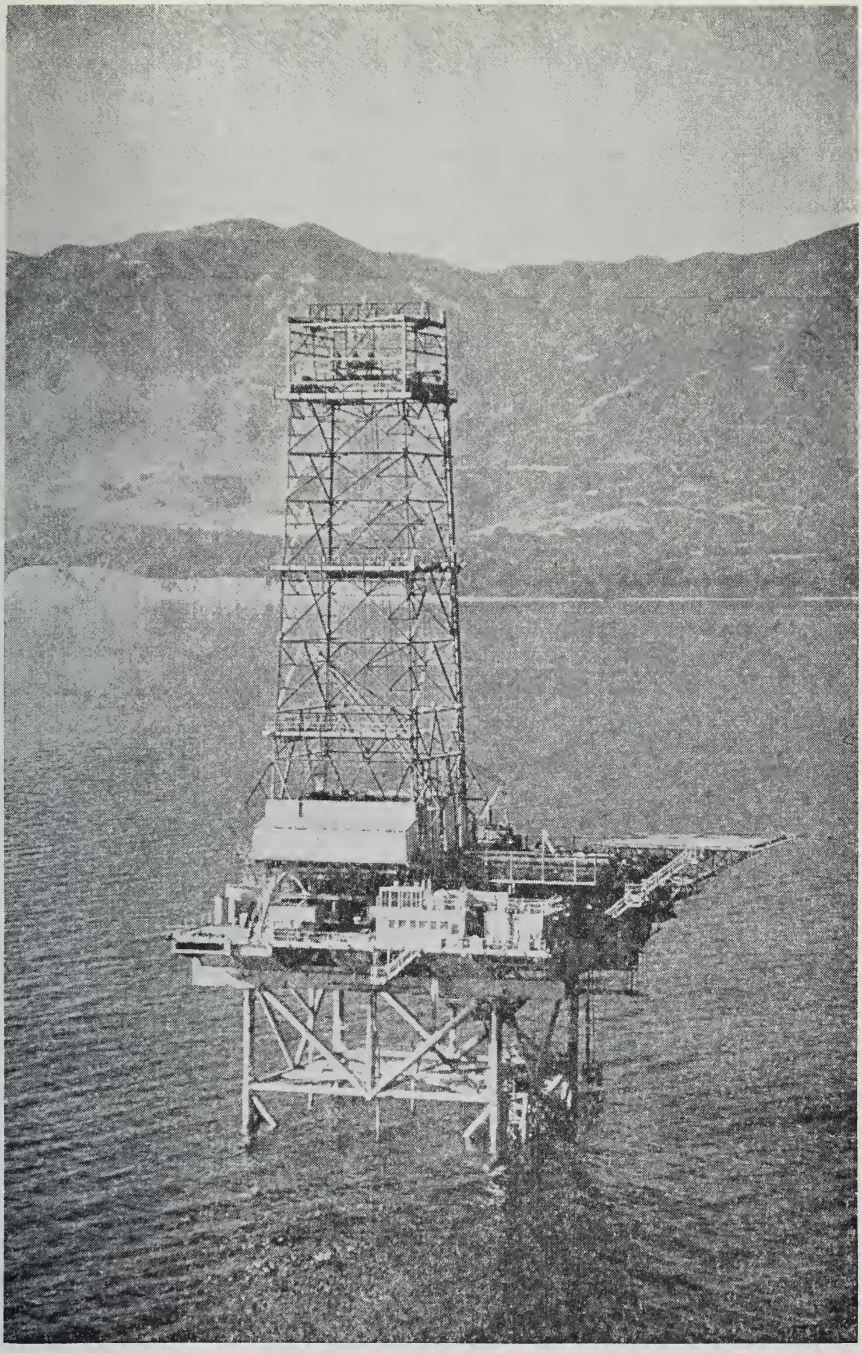


PHOTO 7. Offshore drilling platform number 1 erected in the Summerland Offshore Oil Field, Santa Barbara County. A joint project of the Standard Oil Company of California and the Humble Oil and Refining Company. *Photo courtesy of the Standard Oil Co. of California.*

Table 10. Annual amount and volume of petroleum produced in California, 1865-1959.

Estimate of production (barrels) to and including 1886, from Mineral Resources U. S., 1886, p. 440; estimate of values to and including 1886, made after consulting contemporaneous publications including Mining and Scientific Press, Reports of the State Mineralogist, and reports of the U. S. Geological Survey. Figures from 1887-1946 compiled from records of the State Division of Mines; 1947-1959 U. S. Bureau of Mines in cooperation with California Division of Mines.

Year	Barrels	Value	Year	Barrels	Value
1865			1918	99,731,177	$127,459,221
1865-75	175,000	$472,500	1919	101,182,962	142,610,563
1876	12,000	30,000	1920	103,377,361	178,394,937
1877	13,000	29,250	1921	112,599,860	203,138,225
1878	15,227	30,454	1922	138,468,222	173,381,265
1879	19,858	39,716	1923	262,875,690	242,731,309
1880	40,552	60,828	1924	228,933,471	274,652,874
1881	99,862	124,828	1925	232,492,147	330,609,829
1882	128,636	257,272	1926	224,673,281	345,546,677
1883	142,857	285,714	1927	231,195,774	260,735,498
1884	262,000	655,000	1928	231,811,465	229,998,680
1885	325,000	750,750	1929	292,534,221	321,366,863
1886	377,145	870,205	1930	227,328,988	271,699,046
1887	678,572	1,357,144	1931	188,310,605	141,835,723
1888	690,333	1,380,666	1932	177,745,286	142,890,247
1889	303,220	368,048	1933	172,139,362	143,063,972
1890	307,360	384,200	1934	174,721,282	159,529,671
1891	323,600	401,264	1935	205,979,855	179,335,311
1892	385,049	561,333	1936	214,776,227	211,667,185
1893	470,179	608,092	1937	238,558,562	237,845,872
1894	783,078	1,064,521	1938	249,395,763	258,354,343
1895	1,245,339	1,000,235	1939	224,253,110	226,358,856
1896	1,257,780	1,180,793	1940	223,294,805	207,479,800
1897	1,911,569	1,918,269	1941	229,664,784	218,838,171
1898	2,249,088	2,376,420	1942	247,491,289	242,481,545
1899	2,677,875	2,660,793	1943	284,145,702	289,323,406
1900	4,319,950	4,152,928	1944	311,717,804	330,659,802
1901	7,710,315	2,961,102	1945	328,262,400	342,756,767
1902	14,356,910	4,692,189	1946	317,116,874	386,812,146
1903	24,340,839	7,313,271	1947	333,132,000	572,990,000
1904	29,736,003	8,317,809	1948	340,074,000	822,980,000
1905	34,275,701	9,007,820	1949	332,839,000	752,220,000
1906	32,624,000	9,238,020	1950	327,607,000	707,630,000
1907	40,311,171	16,783,943	1951	354,561,000	797,760,000
1908	48,306,910	26,566,181	1952	359,415,000	801,882,000
1909	58,191,723	32,398,187	1953	364,933,000	908,680,000
1910	77,697,568	37,689,542	1954	355,865,000	907,460,000
1911	84,648,157	40,552,088	1955	354,737,000	886,820,000
1912	89,689,250	41,868,344	1956	350,754,000	918,975,000
1913	98,494,532	48,578,014	1957	339,646,000	1,035,920,000
1914	102,881,907	47,487,109	1958	313,672,000	909,649,000
1915	91,146,620	43,503,837	1959	308,946,000	783,684,000
1916	90,262,557	57,421,334			
1917	95,296,309	86,976,209	TOTALS	11,750,143,930	$18,172,584,026

platform near Summerland, Santa Barbara County, and was immediately shut-in. High-gravity oil was found in rocks of Cretaceous age at San Clemente, Orange County, 24 miles southeast of the Newport Beach field. An off-shore well was apparently completed near Point Conception.

Additions to production were made by field extensions, and by new sand or new pool discoveries at the following oil fields: Wilmington, Rosecrans, Shiells Canyon, South Mountain, Oxnard, Fillmore, Cuarta Canyon offshore, San Ardo, Canfield Ranch, San Emidio Nose, Paloma, Windgap, Pioneer, Midway-Sunset, Guijarral Hills and Helm.

Platinum Group Metals

Serpentine and related basic and ultra-basic igneous rocks are believed to be the primary source of most of the platinum group metals in the placer deposits of California, although no primary deposits of these metals have been found to date.

Crude metals of the platinum group were produced in California during 1959 as a co-product of gold dredging along the Yuba River in Yuba County and along the American River in Sacramento County. The quantity and value of production in 1959 was less than in 1958, owing partly to a decrease in the number of connected-bucket dredges in operation.

Potash

The production of potash in California is almost entirely limited to a single plant that processes the brine of Searles Lake, San Bernardino County. In addition, some potash-bearing flue dust from a cement plant is sold for use as agricultural lime. California potash output, although less than 10 percent of the total United States output, is far in excess of consumption. Much of it is shipped to other west coast states or exported.

Pumice, Pumicite and Volcanic Cinders

The production of pumice, pumicite and volcanic cinders increased substantially during 1959 and totaled 574,297 short tons valued at $2,162,149, compared to 376,789 short tons valued at $1,670,170 in 1958.

Of the 1959 production, 121,561 short tons valued at $1,285,599 were pumice and pumicite compared to 116,604 short tons valued at $1,112,312 in 1958; and 452,736 short tons valued at $876,550 were volcanic cinders, compared to 260,185 short tons valued at $557,858 in 1958.

The volcanic cinders were used chiefly as railroad ballast, road base, road fill, and in concrete aggregate.

The pumice was used chiefly in scouring blocks, landscaping materials, concrete aggregate for building blocks and other construction purposes, pesticide diluents, insulation, absorbents, acoustical plaster, pozzolans, paint and cleaning compounds.

Pyrite

California has been one of the leading pyrite-producing states for many years. Pyrite is produced for its sulfur content but only the massive deposits have been mined. The California production came from the large open pit of the Hornet mine on Iron Mountain, Shasta County, whose product averages 48 percent in sulfur content. Production in 1959 increased slightly compared to 1958. The entire output was sold to chemical plants on San Francisco Bay and used in the manufacture of sulfuric acid.

Rare Earth Minerals

The production of rare earth minerals from an open pit at the Sulfide Queen mine near Mountain Pass, San Bernardino County, began in 1952 and has continued through 1959. The rare earth elements, cerium, lanthanum, neodymium, praesedymium and samarium are found in the mineral bastnaesite, a fluocarbonate. The ore is treated

Table 11. Sand and gravel sold or used by producers, by commercial and government-and-contractor operations, and by uses

(Thousand short tons and thousand dollars)

Use	1958		1959	
	Quantity	Value	Quantity	Value
COMMERCIAL OPERATIONS				
Sand				
Glass	453	$1,917	499	$1,958
Molding	[1]	[1]	50	224
Building	15,602	18,061	17,430	21,848
Paving	7,622	7,448	8,881	9,932
Blast	187	564	202	796
Engine	85	166	55	177
Filter	164	76	----	----
Other	3,941	3,833	4,650	4,316
Total	28,054	32,065	31,767	39,251
Gravel:				
Building	17,641	24,144	20,091	29,463
Paving	18,705	20,875	20,061	24,739
Railroad ballast	224	223	297	318
Other	3,588	3,501	3,795	3,669
Total	40,158	48,743	44,244	58,189
Total sand and gravel	68,212	80,808	76,011	97,440
GOVERNMENT-AND-CONTRACTOR OPERATIONS[2]				
Sand:				
Building	9	15	14	15
Paving	2,747	2,630	2,320	2,317
Total	2,756	2,645	2,334	2,332
Gravel:				
Building	25	32	87	63
Paving	13,144	11,855	9,513	9,074
Total	13,169	11,887	9,600	9,137
Total sand and gravel	15,925	14,532	11,934	11,469
ALL OPERATIONS				
Sand	30,810	34,710	34,101	41,583
Gravel	53,327	60,630	53,844	67,326
Grand total	84,137	95,340	87,945	108,909

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."
[2] Includes figures for States, counties, municipalities, and other Government agencies.

in a flotation plant at the mine and a high grade rare earth oxide concentrate is produced.

An experimental gravity concentrator was built near Twentynine Palms, Riverside County, to process ore for the recovery of rare earths. The deposit is in the Pinto biotite gneiss of Precambrian age. Xenotime, an yttrium phosphate, is one of the principal minerals in the ore.

Salt

California is fifth among the states in the production of common salt (sodium chloride). Most of the salt is produced by solar evaporation

of sea water on the shores of southern San Francisco Bay in Alameda and San Mateo Counties. Similar recovery methods are used also at Monterey Bay, Monterey County; Newport Bay, Orange County; and on San Diego Bay, San Diego County. In addition, there is a significant output of salt from dry lakes in Kern and San Bernardino Counties in the desert of southeastern California.

The quantity and value of salt produced in California in 1959 increased from the 1958 figures. In 1959, 1,388,000 short tons of salt were produced, compared to 1,297,000 short tons in 1958.

Sand and Gravel

California production of sand and gravel reached an all-time high in 1959, totaling 87,944,973 short tons valued at $108,909,000. The production in 1958 was 84,136,582 short tons valued at $95,339,829.

Production from commercial plants during 1959 totaled 76,011,341 short tons valued at $97,440,417, compared to 68,211,571 short tons valued at $80,808,010 in 1958.

Noncommercial production during 1959 totaled 11,933,632 short tons valued at $11,468,708 compared with 15,925,011 short tons valued at $14,531,819 in 1958. The "noncommercial" sand and gravel embraces the output from government-and-contractor plants which supply aggregate for flood control projects, construction of dams and highways. As a high percentage of sand and gravel is used in building and related construction projects, the largest amount was produced near large metropolitan centers; Los Angeles, Alameda, and San Diego Counties together produced 42 percent of the state's commercial sand and gravel. The distribution of sand and gravel production in 1959 by uses is shown in tables 10 and 11.

Silica

Commercial silica includes silica sand, quartzite, quartz from veins and pegmatites, and quartz cobbles; these commodities are in part interchangeable in industry and may be conveniently considered together. For several years the U.S. Bureau of Mines has placed statistics for glass sand with those for sand and gravel; starting with 1956, quartz and ground silica sand were included with crushed rock.

Quartzite was mined from properties in Inyo and San Bernardino Counties. Glass sand was obtained from properties in Amador, Calaveras, Monterey, and Riverside Counties; fire sand was produced in Orange County. Quartz was mined from deposits in Sierra County and Kern County.

Vein quartz was mined by the Reno Silica Company from a large deposit at Crystal Peak in eastern Sierra County for use in the production of silicon. The Lowrie Paving Company erected a plant near Colfax to produce silica flour by grinding white quartz gravel from the Bear River, Placer County.

Silver

Silver production in California during 1959 totaled 172,902 troy ounces valued at $156,485, compared to 188,260 troy ounces valued at $170,385 in 1958. Placer gold mines, chiefly bucket-line dredges, produced 6146 troy ounces of the 1959 production valued at $5,562; while lode mines produced 166,756 troy ounces valued at $150,923.

Most of the silver was produced as a co-product at the Pine Creek tungsten mines and at lead-zinc mines in Inyo County; while a smaller quantity was produced as a co-product at lode gold mines in Siskiyou, Sierra and Nevada Counties.

Slate

One quarry in El Dorado County and two quarries in Mariposa County produced slate in 1959. Production showed a slight increase in quantity and value compared to 1958.

Most of the slate produced was crushed for use as roofing granules or ground to slate flour for use as filler. A small quantity was used as roofing slate, flagging and as building stone (facing).

Sodium Carbonate

The natural sodium carbonate produced in California during 1959 was soda ash from two properties on Searles Dry Lake, San Bernardino County, and soda ash and sodium sesquicarbonate (trona) from the property on Owens Lake in Inyo County. The glass and chemical industries are the principal consumers of sodium carbonate. The quantity and value of production increased slightly compared to 1958.

Sodium Sulfate

California leads the nation in the production of natural sodium sulfate. The sodium sulfate produced in California during 1959 came from two properties on Searles Dry Lake in San Bernardino County and consisted of salt cake and glauber's salt. The quantity and value of production increased compared to 1958.

Table 12. Stone sold or used by producers, by kinds.

Year	Granite		Basalt and related rocks (traprock)		Limestone[1]	
	Short tons	Value	Short tons	Value	Short tons	Value
1955	2,724,342	$3,420,057	1,923,351	$2,547,821	12,472,285	$21,075,656
1956	3,899,350	5,155,292	1,966,581	2,339,318	14,115,070	22,118,105
1957	12,744,413	10,564,922	1,952,417	2,431,926	14,102,264	22,511,933
1958	3,649,390	5,347,679	1,498,912	1,738,570	14,408,695	22,583,791
1959	4,343,101	5,432,902	1,772,035	2,727,699	16,136,874	24,383,955

Year	Sandstone		Other stone[2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1955	2,937,537	$4,886,507	4,650,806	$5,234,343	24,708,321	$37,164,384
1956	2,917,916	4,833,877	9,684,453	11,662,060	32,583,370	46,108,652
1957	4,222,211	6,679,968	8,329,954	11,402,340	41,351,259	53,591,089
1958	3,933,245	5,687,984	8,933,057	12,987,471	32,423,299	48,345,495
1959	2,758,317	4,506,303	7,123,555	12,038,968	32,133,882	49,089,827

[1] Excludes limestone and oystershell used in cement and lime as follows: 1955, 10,977,552 tons, $16,431,434; 1956, 12,259,540 tons, $17,354,910; 1957, 11,860,832 tons, $16,489,192; 1958, 12,351,907 tons, $16,421,501; 1959, 13,663,360 tons, $16,628,498.

[2] Includes light-colored volcanics, schist, serpentine, chert, and such other stone as cannot properly be classed in any main group; also marble (1955-59) and slate (1958-59).

Stone

The total stone produced in California in 1959 was 32,133,882 tons valued at $49,089,827. The stone industry is divided into two categories 1) crushed and broken stone and 2) dimension stone. The term "dimension stone" is applied to natural stone that is cut to definite size and shape and includes cut, carved and roughhewn blocks of building stone, flagging, and cut and polished monumental stone. Dimension stone production consisted of 58,457 short tons valued at $1,287,799, compared to 55,798 short tons valued at $1,103,022 produced in 1958. The principal rock types quarried for dimension stone were granite, (for monuments), light-colored volcanic rock, mica schist, and siliceous shale of the Monterey formation.

The term "crushed stone" is applied to irregular rock fragments which result from crushing and grinding that are not of specific shape. Crushed stone, is used as bituminous aggregate, railroad ballast, road base, and in chemical, metallurgical and industrial processes. "Broken stone" applies to large masses of rock quarried for use as breakwater protection or as riprap. The total production of crushed and broken stone was 32,075,425 short tons valued at $47,802,028 in 1959, a slight decrease in quantity for 1958 when 32,367,501 short tons were produced but an increase in value for 1958: $47,242,473. This production

Table 13. Stone sold or used by producers, by uses.

Use	1958		1959	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough construction and rubble—short tons	48,560	$628,481	48,042	$576,338
Rough architectural—cubic feet	[1]72,582	[1]443,630	[2]37,992	[2]267,742
Approximate equivalent in short tons	6,078		3,160	
Monuments and mausoleums—cubic feet	[3]	[3]	45,939	368,276
Approximate equivalent in short tons	[3]		3,871	
Flagging—cubic feet	11,636	30,911	41,130	75,443
Approximate equivalent in short tons	1,160		3,384	
Total dimension stone (quantities approximate, in short tons)	55,798	1,103,022	58,457	1,287,799
Crushed and broken stone:				
Riprap—short tons	4,535,718	6,041,468	2,988,354	4,791,958
Metallurgical—do	[4]	[4]	[4]	[4]
Concrete and roadstone—do	10,248,237	12,871,300	10,508,699	13,458,238
Railroad ballast—do	105,802	115,327	[4]	[4]
Agricultural—do	[4]	[4]	[4]	[4]
Chemical—do	12,467	41,426	[4]	[4]
Miscellaneous[5]—do	[6]17,465,277	[6]28,172,952	[7]18,578,372	[7]29,551,832
Total crushed and broken stone—do	32,367,501	47,242,473	32,075,425	47,802,028
Grand total (quantities approximate, in short tons)	32,423,299	48,345,495	32,133,882	49,089,827

[1] Includes dressed architectural and rough and dressed monumental stone.
[2] Includes dressed architectural and roofing slate.
[3] Included with "Rough architectural" to avoid disclosing individual company confidential data.
[4] Included with "Miscellaneous" to avoid disclosing individual company confidential data.
[5] Includes whiting substitute, filler, mineral food, poultry grit, stucco, roofing granules, filter beds, terrazzo, metallurgical, railroad ballast, agricultural, chemical (1959), and miscellaneous uses.
[6] Includes 11,794,819 short tons of limestone and oystershell used in cement valued at $14,949,555 and 557,088 tons of limestone used in lime valued at $1,471,946.
[7] Includes 12,886,476 short tons of limestone and oystershell used in cement valued at $14,485,668 and 776,884 tons of limestone used in lime valued at $2,142,830.

was obtained principally from granite, sandstone, basalt, limestone, tuff, greenstone, and chert.

The quantity and value of total stone sold or used by producers is presented in the following table by uses.

Dimension granite showed an increase in value of production from $455,029 in 1958 to $634,286 in 1959.

Sulfur

Nearly all the sulfur ore mined in California during 1959 came from the open pit Leviathan mine in Alpine County. The sulfur content (about 30 percent) was converted into sulfuric acid at Weed Heights, Nevada, and used to leach a low-grade copper carbonate ore from a deposit near Yerington, Nevada.

A small production of sulfur ore was made in 1959 from the Crater claims east of Big Pine, Inyo County; from the Sulphur Bank mercury mine and the S-Bar-S deposit in Lake County; and from the Banana claim near Taft, Kern County. All this material was used as a soil additive.

By-product sulfur was produced from petroleum refineries in Contra Costa, Los Angeles and San Luis Obispo Counties; by-product hydrogen sulfide from petroleum refineries in Contra Costa and Los Angeles Counties; and liquid sulfur dioxide and sulfuric acid from a lead smelter in Contra Costa County.

Talc, Soapstone and Pyrophyllite

The talc, soapstone and pyrophyllite produced in California during 1959 totaled 148,266 short tons valued at $1,500,260, compared to 129,638 short tons valued at $1,339,069 in 1958. Virtually all this material was ground by producers or shipped to grinding plants.

All of the 1959 talc production was mined from 14 properties in Inyo County, 13 properties in San Bernardino County, except for a few tons of crude talc in Shasta County. Pyrophyllite was mined at three deposits in San Diego County and two properties in Mono County and one in Inyo County. Two properties in El Dorado County, and one property in Los Angeles County yielded the entire state output of soapstone.

Crude talc was produced in 14 properties in Inyo County and one in San Bernardino County; crude soapstone was produced from El Dorado and Los Angeles Counties; crude pyrophyllite was won from Mono, San Diego, Inyo, and San Bernardino Counties.

Prepared products sold or used during 1959 consisted of 129,097 short tons of ground talc and soapstone valued at $3,856,422 and 13,281 short tons of ground pyrophyllite valued at $283,025. The ground material prepared in 1958 totaled 117,176 short tons valued at $3,237,820.

Consumption of the 1959 output of ground talc and soapstone by industry was as follows: ceramics, 67,863 short tons; paint, 26,362 short tons; insecticides, 13,198 short tons; rubber, 4,482 short tons; toilet preparations, 2,635 short tons. Small quantities were used also in asphalt fillers, paper, rice polishing, textiles, refractories, and stucco.

Ground pyrophyllite was used in insecticides (10,540 short tons), paints and batteries.

Tungsten Ore

The Pine Creek mine, about 20 miles (airline) west of Bishop, Inyo County, was the only producer of tungsten ore and concentrates in California during 1959. This mine contains the largest known reserve of tungsten ore in the United States. In addition, molybdenum, copper, silver and gold are produced as co-products. Production increased over 1958.

Some drifting on a new ore body was done at the Strawberry mine in eastern Madera County but no ore was produced.

Uranium

A very small tonnage of uranium ore was mined in California during 1959 and shipped to Salt Lake City, Utah. The 1959 shipments were made from single properties in Kern and Lassen Counties. The average U_3O_8 content of the ore shipped was 0.21 percent and the average value of the ore, f.o.b. mine, was $17.52 per ton.

Wollastonite

Wollastonite production in California declined in 1959 compared with 1958. Woolstone, Inc., operated the rockwool plant north of Blythe, Riverside County, on a pilot basis for a short period during the early part of 1959. Thereafter, the plant was closed pending plant-lease negotiations.

A small tonnage of wollastonite from Riverside County was produced and used as ornamental stone in patios and facing for homes and small buildings. Here, the mottled appearance and fluted structure of the stone make it suitable for decorative purposes.

Zinc

The zinc produced in California during 1959 totaled 156,000 pounds of recoverable metal valued at $17,940 compared to 102,000 pounds valued at $10,404 in 1958. Most of the production was from the lead-zinc mines of Inyo County.

MINERAL PRODUCTION IN THE COUNTIES OF CALIFORNIA, 1959

Each of California's 58 counties made some contribution to the total mineral production during 1959. The value of production from four counties was more than $100 million. Fuels amounted to more than 80 percent in all four; the remainder was mostly structural materials, and, in Kern County, borates.

Table 14a. Leading mineral-producing counties in 1959 (see table 14b).

Kern	$341,152,624
Los Angeles	241,672,519
Ventura	156,436,939
Orange	112,632,148

The value of production from 13 counties was between $10 million and $100 million. Most of these counties produced fuels, and in three—Fresno, Santa Barbara, and Kings—fuels predominated. In five counties, however, structural materials predominated. These were Santa Clara, Calaveras, San Diego, San Mateo, and Santa Cruz. The remaining five produced a wide variety of mineral commodities. San Bernar-

dino County, the largest in the state and the seventh in order of mineral production, produced 26 commodities, of which cement, borates, sodium compounds, and potash predominated.

Table 14b. Leading mineral-producing counties in 1959 (see table 14a).

Fresno	$96,785,469
Santa Barbara	89,432,758
San Bernardino	85,193,487
Riverside	37,408,611
Santa Clara	29,425,563
Monterey	27,713,852
Alameda	20,527,931
Sacramento	17,440,123
Calaveras	15,094,715
San Diego	14,489,604
Kings	13,598,491
San Mateo	13,109,357
Santa Cruz	10,069,197

The value of production from 26 additional counties was between $1 million and $10 million, and 15 counties produced mineral commodities valued at less than a million dollars. Sierra County, with a production of $979,641, was the only county in the state in which metals predominated.

Table 15. Mineral production by counties, 1959.†

Product	Unit	Quantity	Value
Alameda County			
Clay	short tons	33,887	$76,280
Sand and gravel	short tons	7,786,722	12,476,424
Stone (crushed)	short tons	979,480	1,003,865
Unapportioned*			6,971,362
Total value			$20,527,931

* Includes bromine, lime, magnesium salts, and salt.

Alpine County

Mineral output of Alpine County consisted of crushed stone and sulfur ore.

Amador County			
Clay	short tons	84,591	$321,889
Gold	troy ounces	62	2,170
Silver	troy ounces	10	9
Stone (crushed)	short tons		43,591
Unapportioned		*	1,028,544
Total value			$1,396,203

* Includes clay, coal (lignite) and sand and gravel.

Butte County			
Gold	troy ounces	40	$1,400
Natural gas	M cubic feet	4,050,000	2,094,366
Sand and gravel	short tons	451,952	941,766
Silver	troy ounces	3	3
Other minerals			121,717
Total value			$3,159,252

† Revised.

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Calaveras County			
Gem stones			$100
Gold	troy ounces	167	5,845
Sand and gravel	short tons	119,239	381,634
Silver	troy ounces	26	23
Unapportioned*			14,707,113
Total value			$15,094,715
* Includes cement, clay, stone (crushed), and tungsten concentrates.			
Colusa County			
Natural gas	M cubic feet	5,180,000	$1,198,793
Sand and gravel	short tons	316,943	379,584
Total value			$1,578,377
Contra Costa County			
Sand	short tons	219,738	$205,405
Stone (crushed)	short tons	1,863,436	2,872,776
Unapportioned*			597,374
Total value			$3,675,555
* Includes clay, natural gas, and peat.			
Del Norte County			
Sand and gravel	short tons	335,680	$359,374
Stone (crushed)	short tons	48,810	51,322
Other minerals			35
Total value			$410,731
El Dorado County			
Gold	troy ounces	299	$10,465
Sand and gravel	short tons	241,255	290,477
Stone (crushed)	short tons	684,887	2,084,710
Unapportioned*			762,399
Total value			$3,148,051
* Includes lead, lime, silver, soapstone and zinc.			
Fresno County			
Gold	troy ounces	388	$13,580
Natural gas	M cubic feet	30,368,000	7,027,415
Natural gas gasoline	gallons	28,433,000	2,462,000
Liquefied petroleum gases	gallons	27,246,000	1,513,000
Petroleum	barrels	30,112,000	82,355,000
Sand and gravel	short tons	2,706,201	3,253,450
Silver	troy ounces	53	48
Stone (crushed, dimension)	short tons	53,092	132,767
Unapportioned*			28,209
Total value			$96,785,469
* Includes clay, mercury and pumice.			
Glenn County			
Natural gas	M cubic feet	32,468,000	$7,513,346
Sand and gravel	short tons	423,359	459,677
Total value			$7,973,023

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Humboldt County			
Natural gas	M cubic feet	998,000	$231,036
Sand and gravel	short tons	1,374,534	1,306,961
Stone (crushed)	short tons	111,917	98,284
Unapportioned*			85,261
Total value			$1,721,542

* Includes copper, gem stones, gold, manganese ore (35% + Mn), and silver.

Imperial County			
Sand and gravel	short tons	510,969	$479,147
Stone	short tons	33,059	24,759
Unapportioned*			2,844,534
Total value			$3,348,440

* Includes gem stones, gypsum, manganese ore (35% ± Mn), pumice.

Inyo County			
Gold	troy ounces	227	$7,945
Lead	pounds	442,300	50,865
Sand and gravel	short tons	139,917	161,455
Talc	short tons	77,324	790,393
Unapportioned*			7,699,448
Total value			$8,710,106

* Includes borates, clay, copper, gem stones, molybdenum concentrates, perlite, pumice and volcanic cinders, sodium carbonate, sulfur ore, tungsten concentrates, and zinc.

Kern County			
Clay	short tons	24,373	$107,782
Gypsum	short tons	786,620	1,315,885
Natural gas	M cubic feet	108,329,000	25,068,424
Natural gas gasoline	gallons	225,570,000	19,014,000
Liquefied petroleum gas	gallons	133,499,000	8,101,000
Petroleum	barrels	92,692,000	224,684,000
Sand and gravel	short tons	2,592,200	3,078,938
Silver	troy ounces	240	217
Unapportioned*			59,782,378
Total value			$341,152,624

* Includes borates, carbon dioxide gas, cement, diatomite, gem stones, gold, lead, manganese ore (35% + Mn), pumice, salt, sodium sulfate, stone (crushed and dimension), sulfur ore, and uranium concentrates.

Kings County			
Natural gas	M cubic feet	10,571,000	$2,446,200
Petroleum	barrels	1,824,000	5,521,000
Unapportioned*			5,631,291
Total value			$13,598,491

* Includes gypsum, mercury, natural gas gasoline, liquefied petroleum gases, sand and gravel, and stone (crushed).

Lake County			
Sand and gravel	short tons	613,670	$550,876
Stone (crushed)	short tons	15,461	13,091
Unapportioned*			382,026
Total value			$945,993

* Includes manganese ore (35% + Mn), mercury, pumice, volcanic cinders, and sulfur ore.

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Lassen County			
Mineral output of Lassen County consisted of sand and gravel, stone (crushed and dimension), uranium ore, and volcanic cinders.			
Los Angeles County			
Clay	short tons	401,097	$492,762
Gold	troy ounces	125	4,375
Natural gas	M cubic feet	58,980,000	13,648,596
Natural gas gasoline	gallons	255,153,000	20,713,000
Liquefied petroleum gases	gallons	51,989,000	2,611,000
Petroleum	barrels	68,462,000	179,880,000
Sand and gravel	short tons	17,044,457	17,961,899
Silver	troy ounces	17	15
Stone (crushed)	short tons	2,399,915	3,828,038
Unapportioned*			2,532,834
Total value			$241,672,519
* Includes cement, gem stones, iodine, and soapstone.			
Madera County			
Copper	pounds	22,300	$6,846
Natural gas	M cubic feet	2,589,000	599,203
Sand and gravel	short tons	204,758	195,689
Silver	troy ounces	247	224
Unapportioned*			682,508
Total value			$1,484,470
* Includes clay, gold, pumice, pumicite and stone (crushed and dimension).			
Marin County			
The mineral output of Marin County consisted of clay, mercury, sand and gravel, and crushed stone, having a total value of $1,478,499.			
Mariposa County			
Copper	pounds	100	$31
Gold	troy ounces	1,502	52,570
Sand and gravel	short tons	70,331	87,542
Silver	troy ounces	442	400
Other minerals			18,383
Total value			$158,926
Mendocino County			
Sand and gravel	short tons	516,762	$565,580
Other minerals			203,885
Total value			$769,465
Merced County			
The mineral output of Merced County totaled $1,387,326.			
Modoc County			
The mineral output of Modoc County consisted of gems, peat, pumice, and sand and gravel, having a total value of $899,699.			

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Mono County			
Gold	troy ounces	46	$1,610
Sand and gravel	short tons	189,597	235,298
Silver	troy ounces	261	236
Stone (crushed)	short tons	1,877	1,686
Unapportioned*			770,555
Total value			$1,009,385
* Includes clay, pumice, and pyrophyllite.			
Monterey County			
Petroleum	barrels	10,995,000	17,224,000
Sand and gravel	short tons	1,046,816	1,919,324
Stone (crushed, dimension)	short tons	186,011	
Unapportioned*			8,687,528
Total value			$27,830,852
* Includes feldspar, gem stones, lime, magnesium compounds, mercury, natural gas, salt, and stone (crushed).			
Napa County			
Sand and gravel	short tons	120,220	$119,407
Unapportioned*			742,362
Total value			$861,769
* Includes asbestos, diatomite, gem stones, mercury, crude perlite and stone (crushed).			
Nevada County			
Gold	troy ounces	1,950	$68,250
Unapportioned*			1,179,656
Total value			$1,247,906
* Includes barite, lead, sand and gravel, silver, stone (crushed), and zinc.			
Orange County			
Clay	short tons	34,796	$256,580
Natural gas	M cubic feet	28,826,000	6,670,631
Natural gas gasoline	gallons	91,257,000	7,748,000
Liquefied petroleum gases	gallons	23,517,000	1,051,000
Petroleum	barrels	34,626,000	90,747,000
Sand and gravel	short tons	5,768,548	6,040,274
Unapportioned*			118,663
Total value			$112,632,148
* Includes iodine, peat, salt and stone (crushed).			
Placer County			
Gold	troy ounces	279	$9,765
Sand and gravel	short tons	547,196	558,555
Silver	troy ounces	31	28
Unapportioned*			571,967
Total value			$1,140,315
* Includes clay, stone (crushed) and dimension stone.			
Plumas County			
Gold	troy ounces	95	$3,325
Silver	troy ounces	12	11
Stone (crushed)	short tons	1,824	2,788
Other minerals			212,694
Total value			$218,818

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Riverside County			
Clay	short tons	308,330	$941,112
Gold	troy ounces	1	35
Sand and gravel	short tons	2,167,175	3,545,588
Stone (crushed)	short tons	379,385	1,953,108
Unapportioned*			30,968,516
Total value			$37,408,359

* Includes cement, gem stones, gypsum, iron ore, manganese ore (35% + Mn), petroleum, and peat and wollastonite.

Sacramento County			
Natural gas	M cubic feet	40,065,000	$9,271,405
Sand and gravel	short tons	4,657,508	7,267,562
Unapportioned*			901,156
Total value			$17,440,123

* Includes clay, gold, platinum, silver and stone (crushed).

San Benito County

The mineral output of San Benito County consisted of cement, clay, gem stones, mercury, natural gas, petroleum, sand and gravel, and stone, with a total value of $8,685,418.

San Bernardino County			
Clay	short tons	84,511	$314,204
Copper	pounds	2,600	798
Sand and gravel	short tons	6,310,683	6,258,793
Stone (crushed, dimension)	short tons	964,384	4,152,162
Talc	short tons	43,816	600,139
Unapportioned*			73,886,980
Total value			$85,213,076

* Includes barite, borates, bromine, calcium chloride, cement, feldspar, gem stones, gold, iron ore, lead, lime, lithium salts, manganese ore (35% + Mn), natural gas, petroleum, potash, pumice and volcanic cinders, rare earth minerals, salt, sodium carbonate and sulfate, and zinc.

San Diego County			
Sand and gravel	short tons	7,229,158	$11,426,280
Stone (crushed, dimension)	short tons	1,430,642	2,356,795
Unapportioned*			706,529
Total value			$14,489,604

* Includes clay, gem stones, gold, magnesium chloride, salt, silver, strontium minerals, and pyrophyllite.

San Francisco County

The mineral output of San Francisco County consisted of sand and stone (crushed).

San Joaquin County			
Natural gas	M cubic feet	5,117,000	$1,184,189
Sand and gravel	short tons	1,902,515	2,704,109
Other minerals			94,754
Total value			$3,983,052

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
San Luis Obispo County			
Natural gas	M cubic feet	1,238,000	$286,420
Petroleum	barrels	2,285,000	6,281,000
Sand and gravel	short tons	833,934	957,574
Stone (crushed, dimension)	short tons	371,193	971,330
Unapportioned*			1,313,510
Total value			$9,809,834

* Includes clay, gem stones, gypsum, manganese ore (35% + Mn), mercury, natural gas gasoline, and liquefied petroleum gases.

San Mateo County

The mineral output of San Mateo County consisted of cement, magnesium compounds, natural gas, petroleum, salt, sand and stone (crushed), having a total value of $13,143,280.

Santa Barbara County			
Natural gas	M cubic feet	18,755,000	$4,340,147
Natural gas gasoline	gallons	31,081,000	2,726,000
Liquefied petroleum gases	gallons	42,239,000	2,184,000
Petroleum	barrels	23,189,000	58,360,000
Sand and gravel	short tons	1,800,660	2,013,310
Stone (crushed, dimension)	short tons	432,928	985,483
Other minerals			18,823,818
Total value			$89,432,758
Santa Clara County			
Sand and gravel	short tons	3,321,838	$3,115,570
Stone (crushed)	short tons	2,171,351	1,744,309
Other minerals			24,565,172
Total value			$29,425,051
Santa Cruz County			
Sand and gravel	short tons	762,047	$1,074,999
Stone (crushed, dimension)	short tons	324,084	571,987
Other minerals			8,422,211
Total value			$10,069,197
Shasta County			
Copper	pounds	88,700	$27,231
Gold	troy ounces	514	17,990
Lead	pounds	400	46
Sand and gravel	short tons	957,421	1,264,792
Silver	troy ounces	131	119
Stone (crushed)	short tons	64,576	59,714
Other minerals			767,771
Total value			$2,137,663
Sierra County			
Gold	troy ounces	21,784	$762,440
Sand and gravel	short tons	114,469	109,850
Silver	troy ounces	3,975	3,598
Stone (crushed)	short tons	87,322	103,115
Zinc	pounds	1,200	138
Other minerals			500
Total value			$979,641

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Siskiyou County			
Gold	troy ounces	8,966	$313,810
Pumice, volcanic cinders	short tons	206,599	435,783
Sand and gravel	short tons	534,134	590,572
Silver	troy ounces	25,410	22,997
Other minerals			590
Total value			$1,363,752
Solano County			
Natural gas	M cubic feet	31,868,000	$7,374,581
Stone (crushed)	short tons	46,954	58,790
Unapportioned*			1,328,667
Total value			$8,762,038
* Includes clay, and sand and gravel.			
Sonoma County			
Sand and gravel	short tons	1,527,279	$1,609,962
Stone (crushed)	short tons	215,058	332,723
Unapportioned*			733,101
Total value			$2,675,786
* Includes clay, gem stones, mercury and natural gas.			
Stanislaus County			
Sand and gravel	short tons	717,118	$760,971
Unapportioned*			36,124
Total value			$797,095
* Includes clay, manganese ore (35% ± Mn), mercury, and stone (crushed).			
Sutter County			
The mineral output of Sutter County consisted of clay, natural gas, sand and gravel, and stone (crushed), with a total value of $662,411.			
Tehama County			
The mineral output of Tehama County consisted of manganese ore (35% ± Mn), sand and gravel, and stone (crushed), with a total value of $596,828.			
Trinity County			
Gold	troy ounces	72	$2,520
Silver	troy ounces	7	7
Stone (crushed)	short tons	643,320	548,705
Other minerals			815,442
Total value			$1,366,674
Tulare County			
Natural gas	M cubic feet	6,339,000	$1,466,804
Stone (crushed)	short tons	218,721	207,720
Unapportioned*			1,432,125
Total value			$3,106,649
* Includes barite, clay, petroleum, and sand and gravel.			

Table 15. Mineral production by counties, 1959.—Continued.

Product	Unit	Quantity	Value
Tuolumne County			
The mineral output of Tuolumne County consisted of gold, sand and gravel, silver, and stone (crushed), having a total value of $1,257,348.			
Ventura County			
Natural gas	M cubic feet	91,982,000	$21,285,559
Natural gas gasoline	gallons	159,488,000	11,452,000
Liquefied petroleum gases	gallons	84,678,000	3,618,000
Petroleum	barrels	43,613,000	115,284,000
Sand and gravel	short tons	2,434,113	3,661,841
Stone (crushed, dimension)	short tons	400,913	797,241
Unapportioned*			338,298
Total value			$156,436,939
* Includes clay and gypsum.			
Yolo County			
The mineral output of Yolo County consisted of natural gas, and sand and gravel.			
Yuba County			
Sand and gravel	short tons	609,747	$644,336
Unapportioned*			3,003,831
Total value			$3,648,167
* Includes clay, copper, gold, platinum, silver and zinc.			

A year ago, as a new feature of the Annual Report, there was included a summary of all current work by the Geologic Division of the U.S. Geological Survey. This provided, for readers of the report, a convenient reference to the many investigations—besides those that officially constituted the cooperative program with the Division of Mines—that this Federal agency conducts in California.

Again this year, we are privileged to include such a summary prepared by Dr. Charles A. Anderson, Chief Geologist, U.S. Geological Survey.

ACTIVITIES OF THE GEOLOGIC DIVISION, U.S. GEOLOGICAL SURVEY, IN CALIFORNIA, 1960

By Charles A. Anderson

The Geologic Division's activities that are cooperative with the California Division of Mines are described earlier in this volume. These studies include the following: South Klamath Mountains (William P. Irwin, project geologist), Sierra Foothills mineral belt (Loren D. Clark, project geologist), Eastern Sierra tungsten belt (Charles D. Rinehart, project geologist), Searles Lake (George I. Smith, project geologist), Furnace Creek borate (James F. McAllister, project geologist), and Independence Quadrangle (Donald C. Ross, project geologist).

Other projects of the Geologic Division are:

Big Maria Mountains, W. B. Hamilton in charge. Geologic mapping is continuing in this area. Two reports "Pliocene (?) sediments of salt water origin near Blythe, southeastern California," and "Structure in the Big Maria Mountains of southeastern California," were published in Prof. Paper 400-B.

Blanco Mountain quadrangle, Inyo and Mono Counties, C. A. Nelson in charge. Geologic mapping of the quadrangle is about two-thirds complete. The major plutonic body forming the eastern part of the quadrangle is grossly concordant and its emplacement has resulted in considerable thinning of the stratigraphic section near the contact. A preliminary report on the quadrangle is to be prepared next summer.

Borate marsh investigations, W. C. Smith in charge. Reports on boron and borate resources are being prepared for the revised "Data of geochemistry," and for the metallogenic map series. An administrative report on mineral resources of the Death Valley region was prepared for the National Park Service. "Core logs from five holes near Kramer, California," by W. K. Benda was published as Bulletin 1045-F.

Bullfrog area, Nevada-California (Cooperative), H. R. Cornwall in charge. Mapping has been completed in the Bullfrog quadrangle, and a report is in preparation. A map of the quadrangle has been submitted for publication in the MF series.

Burney area, G. A. Macdonald in charge. A report on the Manzanita Lake and Prospect Peak quadrangles is being prepared on a part-time basis. The Whitmore and Harvey Peak quadrangles are partly mapped.

California chromite, F. G. Wells in charge. Final report on this project is being revised following review.

California offshore aeromagnetic studies, R. W. Bromery in charge. The map GP-211, "Reconnaissance airborne magnetometer survey off southern California," by Bromery, K. O. Emery, and J. R. Balsley, is the final publication from this investigation.

Carboniferous faunas of western United States, M. Gordon, Jr., in charge. Studies of upper Paleozoic faunas in the Basin and Range province are continuing.

Cenozoic invertebrate studies, D. Wilson in charge. Foraminiferal studies by P. B. Smith in the Mojave Desert and in the Repetto Hills, Los Angeles County are in progress. "Foraminifera of the Monterey shale and Puente formation, Santa Ana Mountains and San Juan Capistrano area, California," was published as Professional Paper 294-M, and, "Pleistocene algal pinnacles at Searles Lake, California," by D. W. Scholl was published in Sedimentary Petrology, vol. 30, no. 3. A report, "Fossil foraminifera from the southeastern California deserts," was published in Prof. Paper 400-B. W. P. Woodring's report on the broader features of Cenozoic mollusks and stratigraphy in California is nearing completion.

Coast Range ultramafics, E. H. Bailey in charge. Geologic mapping in the Cazadero area was completed and a report is being prepared. A report "K-feldspar content of Jurassic and Cretaceous graywackes of northern Coast Ranges and Sacramento Valley," by Bailey and W. P. Irwin was published in AAPG Bull., vol. 43, no. 12. In addition, a general report on the Franciscan formation is being prepared by Bailey, together with Irwin, Jones, and Schlocker.

Correlation between geophysical and geological data, San Francisco Bay, G. M. Greve in charge. A regional gravity survey of the San Francisco Bay area is being made by Greve on a part-time basis as a thesis problem. Gravity variations along the San Andreas rift zone will be mapped to obtain structural information and thickness of the sedimentary fill in the basin.

Cuyama Valley area, J. G. Vedder in charge. Geologic mapping is essentially completed in the Wells Ranch and Elkhorn Hills quadrangles and is in progress in the Cuyama Ranch and East of Cuyama Ranch $7\frac{1}{2}$-minute quadrangles. A succession of mammalian faunas has been collected from non-marine beds that intertongue with marine beds containing molluscan and foraminiferal faunas. The sequence includes both Miocene and Pliocene faunas and should provide more definite correlations between marine and continental stages than are now possible.

Death Valley, C. B. Hunt in charge. Geologic mapping has been completed. Results of the studies are being prepared as multiple chapters for a Professional Paper, some nine of which were in completed manuscript form and two more were in preparation. The following brief reports were published in Professional Paper 400-B: "Possible interbasin circulation of ground water in the southern part of the Great Basin," by Hunt and T. W. Robinson; "Observations of current tilting of the earth's surface in the Death Valley, California, area," by G. W. Greene and Hunt; "Some examples of geologic factors in plant distribution," by Hunt; "Salt features that simulate ground

patterns formed in cold climates," by Hunt and A. L. Washburn; "Geochemical investigation of molybdenum at Nevares Spring in Death Valley, California," by F. N. Ward, H. M. Nakagawa and Hunt; and "The Death Valley salt pan, a study of evaporites," by Hunt. One additional report "Petrography of the potter," was published in "Archeology of the Death Valley salt pan," by Alice Hunt, Utah University, Anthropology Paper No. 47.

Diatom studies, K. E. Lohman in charge. Work continues on diatom studies in the Great Basin area and the Mojave Desert area.

In addition to the projects described above, a final report of an otherwise-completed project was published as Bulletin 1087-F, "Geology and ore deposits of the Kern River uranium area," by E. J. MacKevett. Other reports being prepared for publication from otherwise-completed projects include: Albers and Robertson's report on the East Shasta copper-zinc district; Bailey and Everhart's New Almaden report; Hall and MacKevett's Darwin quadrangle; Vedder and Norris' San Nicolas Island; Rinehart and Ross' Mount Morrison quadrangle and Moore's Mount Pinchot quadrangle.

Eastside, Los Angeles Basin, R. F. Yerkes in charge. Geologic mapping has been completed for this project, and subsurface data are now being collated and integrated. Reports on different portions of the area are in preparation for publication as parts of an overall report on the project. A report "Previously unreported Pliocene mollusca from the Southeastern Los Angeles Basin," by J. G. Vedder was published as part of Prof. Paper 400-B. Geologic maps of the La Habra and Whittier quadrangles by Yerkes were released in open file.

Engineering geology of the Oakland East quadrangle, D. H. Radbruch in charge. Detailed field mapping of a complex fault system trending northwestward through the quadrangle is continuing on a part-time basis.

Engineering geology of the San Francisco Bay area; San Francisco North quadrangle, J. Schlocker in charge; *San Francisco South quadrangle,* M. G. Bonilla in charge. Reports on both quadrangles are in preparation. Reports "Rodingite from Angel Island, San Francisco Bay, California," by Schlocker, and, "A sample of California Coast Range landslides," by Bonilla, are included in Prof. Paper 400-B. "Geology of epicentral area of the San Francisco earthquake of March 1957," by Bonilla was published in Special Report 57 of the California Division of Mines. "Landslides in the San Francisco South quadrangle," by Bonilla, and, "Selected logs of borings, San Francisco Bay," by Weaver were released in open file.

Foraminifera of the Lodo formation, central California, M. C. Israelsky in charge. Work continued on a report on the detailed study of the foraminiferal fauna of the Lodo.

Funeral Peak quadrangle, Harald Drewes in charge. The final report on this project has been approved for publication. A report "Origin of the Amargosa thrust fault, Death Valley area, California: a result of strike-slip faulting in Tertiary time," was published in Prof. Paper 400B. "Turtleback faults of Death Valley, California; a reinterpretation," was published in the GSA Bull., vol. 70, no. 12.

Glaucophane schist terranes within the Franciscan formation, R. G. Coleman in charge. Field and laboratory work on stability and transitions of jadeite in serpentine masses is in progress.

Great Basin geophysical studies, D. R. Mabey in charge. The reports "Regional gravity survey of part of the Basin and Range province," by D. R. Mabey, and "Observations of current tilting in Death Valley, California," by G. W. Greene and C. B. Hunt were published in Prof. Paper 400-B. "Gravity Survey of the western Mojave Desert," by Mabey was published as Professional Paper 316-D. A number of other reports are in preparation.

Klamath nickel investigations, P. E. Hotz in charge. Most of the work on this project thus far has been done in the area near Riddle, Oregon. Reconnaissance studies of ultramafic rocks and associated lateritic materials is continuing elsewhere in the Klamath Mountains in both Oregon and California.

Lower Paleozoic studies in the Cordilleran region, C. W. Merriam in charge. The report on Silurian and Lower Devonian rocks of the Klamath Mountains is being revised. A report on studies of Ordovician graptolite faunas of the Basin Ranges has been approved for publication as a bulletin. "Miocene copepods from the Mojave Desert, California," by A. R. Palmer was published in the Journal of Paleontology, vol. 34, no. 3.

Major crustal units, L. C. Pakiser in charge. Crustal and upper mantle structures are being studied by seismic methods in cooperation with the Air Force. Long-range objective of this study is to obtain information on the travel times and other characteristics of seismic waves, and to interpret these in terms of the composition and structure of the upper mantle and crust. Information from regional gravity and magnetic surveys will be integrated. Gravity measurements have been made in an area of 1500 square miles surrounding Lassen Volcanic National Park and will be extended northward. Results of some of this work were the reports, "Volcanism in eastern California—a proposed eruption mechanism," published in Prof. Paper 400-B; "Transcurrent faulting and volcanism in Owens Valley, California," and "Geophysical investigation of Mono Basin, California," both published in Bulletins of the Geological Society of America.

Merced Peak area, Maricopa and Madera Counties, D. L. Peck in charge. Geologic mapping in the southern and eastern parts of the Merced Peak quadrangle is in progress. The work thus far indicates that individual plutons are more numerous than previously known, and metavolcanic rocks and other metamorphic rocks are more abundant.

Mesozoic studies, Pacific Coast, D. L. Jones in charge. Mapping in the Yreka-Hornbrook area is essentially completed and reports on the Upper Cretaceous stratigraphy and fauna are in preparation. R. W. Imlay is assembling data on Jurassic faunas and a report has been approved for publication on Late Jurassic faunas from the Western Sierra Nevada in conjunction with L. D. Clark's work in that area.

Mineralogical research, R. C. Erd in charge. Mineralogical studies continue to develop new information on the borate minerals and their environment of origin both in the field and laboratory. "Gowerite, a

new calcium borate mineral from the Death Valley region," by R. C. Erd, J. F. McAllister, and Hy Almond was published in American Mineralogist, vol. 44, no. 9-10. "The naming of the hydrous magnesium borate minerals from Boron, California—a preliminary note," by W. T. Schaller and M. E. Mrose was published by in American Mineralogist, vol. 45, no. 5-6.

Northwest Sacramento Valley, R. D. Brown, Jr., in charge. Geologic mapping has been completed in the Ladoga quadrangle and a report has been submitted for publication. Mapping is now in progress in the Stonyford quadrangle. A report "Early Cretaceous fossils in submarine slump deposits of Late Cretaceous age, northern Sacramento Valley, California," by Brown and E. I. Rich was published in Prof. Paper 400-B.

Panamint Butte quadrangle, W. E. Hall in charge. The report on economic geology of the Panamint Butte quadrangle and Modoc district has been approved for publication and will be transmitted to your agency for publication this spring as soon as the drafting of illustrations is completed. A preliminary geologic map of the quadrangle is being reviewed for publication. Field work on this project will be resumed in July.

Salinas Valley area, D. L. Durham in charge. Geologic mapping has been completed in the Reliz Canyon, San Lucas and Espinosa Canyon 7½-minute quadrangles and is in progress in the Cosio Knob and Jolon quadrangles. Mapping thus far completed has suggested some needed revisions of the Eocene stratigraphy and several previously unrecognized faults have been identified.

San Andreas fault zone of southern California, L. F. Noble in charge. Work in the Virgin Springs area is continuing on a part-time basis.

Sierra Nevada batholith, east-central California, P. C. Bateman in charge. Geologic mapping in the Mt. Goddard and Blackcap Peak quadrangles, is expected to be completed next summer. Detailed mineralogic and petrologic studies of the igneous rocks are in progress. A report synthesizing the geology of the central part of the Sierra Nevada has been prepared.

Sierra Nevada geophysical studies, H. W. Oliver in charge. Gravity data have been obtained to aid geological mapping projects in the Sierra Nevada batholith region. Aeromagnetic data from previous work is being compiled, and magnetic susceptibilities of selected rock specimens have been obtained to aid interpretation. A number of oriented specimens on which K/A dating has been obtained are being tested for remanent magnetism of the plutons of the Sierra.

Surficial geology of the Beverly Hills, Venice and Topanga quadrangles, Los Angeles County, J. T. McGill in charge. Geologic mapping has been completed in the Beverly Hills quadrangle, and is nearing completion in the other two quadrangles. "Geology of the Baldwin Hills area" and "Surficial geology of the Beverly Hills and Venice quadrangles," both by R. O. Castle, were released in open file. Reports on several parts of the area are in preparation. Plans have now been completed to initiate additional similar work in cooperation with Los Angeles County, in quadrangles that are chiefly under their jurisdiction. This work is scheduled to begin in the Malibu Beach quadrangle.

Thermal waters, D. E. White in charge. Studies of composition and origin of natural waters are continuing, including work on waters at Sulfur Bank and on the geochemical aspects of crude oil and brines of the Cymric oilfield, Kern County.

Upper Amargosa Valley, California-Nevada, C. S. Denny in charge. Reports on the Ash Meadows quadrangle, on alluvial fans of the Death Valley region, and on landslides east of the Funeral Mountains are being prepared.

Upper San Joaquin Basin, F. M. Fryxell in charge. Prof. Fryxell is working on a manuscript on a glacial reconnaissance of Sequoia National Park as time from other duties permits. Professional Paper 329, "Geomorphology and glacial geology, San Joaquin basin, California," was published during the year.

Vertebrate faunas, G. E. Lewis in charge. Work continues on preparation of reports on vertebrate faunas of the Mojave Desert.

Western Los Angeles Basin gravity survey, T. H. McCulloh in charge. The final report on this project is now being completed. A report "Gravity variations and the geology of the Los Angeles Basin of California," was published as part of Prof. Paper 400-B. A geologic map of the Lane Mountain quadrangle was released in open file.

Western Mojave Desert, T. W. Dibblee, Jr., in charge. The comprehensive report on this project is to be completed next Fall. Five geologic maps were published in the MF series during the past year, covering the Apple Valley, Barstow, Hawes, Shadow Mountains and Victorville quadrangles. Manuscripts for two bulletins have been approved for publication, and are being edited. Geologic maps of three quadrangles are being prepared for publication.

Western oxidized zinc ore deposits, A. V. Heyl in charge. A report on the oxidized zinc deposits of California and Nevada has been prepared, and the final report on general geology of the oxidized zinc deposits of the western United States is undergoing a review.

Not included this year is the Annual Review of Metals, Minerals and Fuels, prepared by the U.S. Bureau of Mines. For a number of years, we have included this review in the Reports of the State Mineralogist in order to present this timely material on the nation-wide picture to our readers. During these years, publication problems of the U.S. Bureau of Mines had prevented their own prompt public dissemination of the data. Now, however, the Bureau is fully current with this important publication and there is no point to be served in repeating the material in our volume.

DIRECTORY OF CALIFORNIA MINERAL PRODUCERS 1959

By
Fenelon F. Davis and Harold B. Goldman*

INDEX TO COMMODITIES

	Page
Asbestos	126
Barite	126
Borates	126
Bromine	127
Calcium chloride	127
Cement	128
Clay	129
Coal	133
Copper	133
Diatomite	134
Dolomite (see lime and limestone)	
Feldspar	134
Fluorspar	134
Gold	135
Granite (see stone, dimension)	
Gypsum	137
Iodine	138
Iron ore	138
Lead	138
Lime and limestone (including dolomite and shells)	139
Lithium salts	141
Magnesium compounds	141
Magnesite	141
Manganese ore	142
Mercury	143
Molybdenum ore	145
Peat	145
Perlite	146
Platinum group metals	146
Potash	147
Pumice, pumicite, and volcanic cinders	147
Pyrite	149
Quartz and quartzite	149
Rare earth minerals	149
Roofing granules	150
Salt	151
Sand and gravel	152
Sand (specialty)	166
Shale (expansible)	167
Silver	168
Slate	169
Sodium carbonate and sodium sulfate	169
Stone (crushed and broken)	
Granite	170
Limestone and marble	172
Miscellaneous	173
Sandstone	176
Volcanic rock	177
Stone (dimension)	
Granite	178
Other	179
Sulfur ore	181
Talc, soapstone and pyrophyllite	182
Tungsten ore	183
Uranium ore	183
Wollastonite	184
Zinc	184

* Mining Geologists, California Division of Mines

DIRECTORY OF MINERAL PRODUCERS IN CALIFORNIA FOR 1959 *

Asbestos

Mine	Operator	Address	Location
Napa County			
Phoenix (chrysotile)	Asbestos Bonding Co.	4459 Redwood Rd., Napa	Steel Canyon

Barite

Operator	Address	Location
Nevada County		
Industrial Minerals & Chemical Co.	836 Gilman St., Berkeley 10	Washington
San Bernardino County		
Oil Base Inc.	130 Oris St., Compton	Barstow
Tulare County		
Macco Corp., Drilling Fluids Div.	14409 S. Paramount Blvd., Paramount	Nine Mile Canyon

Borates

Operator	Address	Location
Inyo County		
Pacific Coast Borax Div., U. S. Borax & Chemical Corp.	P.O. Box 75128 Sanford Sta., Los Angeles 5	Shoshone
Kern County		
Pacific Coast Borax Division, U. S. Borax & Chemical Corp.	P.O. Box 75128 Sanford Sta., Los Angeles 5	Boron
San Bernardino County		
American Potash and Chemical Corp.	3000 W. 6th St., Los Angeles 54	Trona
West End Chemical Division, Stauffer Chemical Co.	1956 Webster St., Oakland 12	Westend

* Addresses corrected to 1960. Producers of natural gas and petroleum may be found in the "Summary of Operations, California Oil Fields," July-December 1959, Vol. 45, No. 2, of the State Division of Oil and Gas.

Bromine

Operator	Address	Location
Alameda County		
Westvaco Mineral Products Division Food Machinery and Chemical Corp.	P.O. Box 337, Newark	Newark
San Bernardino County		
American Potash & Chemical Co.	3000 W. Sixth St., Los Angeles 54	Trona

Calcium Chloride

Operator	Address	Location
San Bernardino County		
California Rock Salt Co.	2436 Hunter St., Los Angeles 21	Amboy
Hill Brothers Chemical Co.	2159 Bay St., Los Angeles 21	Amboy
National Chloride Company of America	Rm. 625, 433 S. Spring St., Los Angeles 13	Amboy

Cement

Operator	Address	Location
Calaveras County		
Calaveras Cement Div., The Flintkote Co.	315 Montgomery St., San Francisco 4	San Andreas
Kern County		
Monolith Portland Cement Co.	Box 65947 Glassell Sta., Los Angeles 65	Monolith
California Portland Cement Co.	612 S. Flower St., Los Angeles 17	Creal
Los Angeles County		
Blue Diamond Div., The Flintkote Co.	1650 S. Alameda St., Los Angeles 54	Los Angeles
Riverside County		
Riverside Div., American Cement Co.	621 S. Hope St., Los Angeles 17	Crestmore
San Benito County		
Ideal Cement Co.	620 Denver Nat. Bank Bldg., Denver 2, Colo.	San Juan Bautista
San Bernardino County		
California Portland Cement Co.	612 S. Flower St., Los Angeles 17	Colton
Permanente Cement Co.	1924 Broadway, Oakland	Lucerne Valley
Riverside Div., American Cement Co.	621 S. Hope St., Los Angeles 17	Oro Grande
Southwestern Portland Cement Co.	1034 Wilshire Blvd., Los Angeles 17	Victorville
San Mateo County		
Ideal Cement Co.	620 Denver Nat. Bank Bldg., Denver 2, Colo.	Redwood City
Santa Clara County		
Permanente Cement Co.	Permanente	Permanente
Santa Cruz County		
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Davenport
	300 W. Sixth St., Los Angeles 54	

Clay

Operator	Product*	Address	Location
Alameda County			
California Pottery Company	a	P.O. Box 2068, Fremont	Niles
Interlocking Roof Tile Co.	a, f	35583 Mission Blvd., Niles	Niles
Kraftile Co.	a	P.O. Box 2907, Fremont	Niles
Lowrie Paving Co.	f	174 San Bruno Rd., South San Francisco	Tesla
E. H. Metcalf Materials	a	P.O. Box 1069, Livermore	Livermore
Amador County			
Gladding, McBean & Co.	f	2901 Los Feliz Blvd., Los Angeles 39	Ione
Pacific Clay Products	f	1255 W. Fourth St., Los Angeles	Ione
Ione Clay and Sand Co.	a, f	P.O. Box 25, Ione	Ione
Harbison-Walker Refractories Co.	f	1800 Farmers Bank Bldg., Pittsburg	Ione
Calaveras County			
California Pottery Co.	f	P.O. Box 2068, Fremont	Valley Springs
Pacific Clay Products Co.	f	1255 W. Fourth St., Los Angeles	Valley Springs
Contra Costa County			
Port Costa Brick Works, C. G. Berg, Pres.	a	401 Berry St., San Francisco 7	Port Costa
United Materials & Richmond Brick Co., Ltd.	a	P.O. Box 7, Richmond 3	Point Richmond
Fresno County			
Craycroft Brick Co.	a	P.O. Box 814, Fresno	Fresno
Hans Sumpf Co.	j	Route 1, Box 570, Fresno	Fresno
Inyo County			
Multi Mines, Inc.	b	2552 E. Olympic Blvd., Los Angeles	Tecopa
Sierra Talc Co.	g	1608 Huntington Dr., South Pasadena	Olancha
Silicates Corp., (L. R. Moretti, Trustee)	b	100 Palm Ave., San Rafael	Death Valley Junction
Kern County			
American Minerals Co.	a	840 S. Mission Rd., Los Angeles 23	Cantil
Excel Minerals Co.	e	3461 E. 26th St., Los Angeles	Taft
Macco Corp., Drilling Fluids Div.	h	14409 S. Paramount Blvd., Paramount	Rosamond
McKittrick Mud Co.	h	P.O. Box 356, McKittrick	McKittrick
Mojave Corp.	h	12827 E. Imperial Highway, Norwalk	Muroc

Clay—Continued

Operator	Product*	Address	Location
Los Angeles County			
Angulo Tile Co.	a	P.O. Box 97, 19044 Kittridge St., Reseda	Reseda
Atkinson Brick Co.	a	13633 S. Central Ave., Los Angeles	Los Angeles
Castaic Clay Manufacturing Co.	a	P.O. Box 180, Castaic	Castaic
Davidson Brick Co.	a	4701 E. Floral Dr., Los Angeles 22	Los Angeles
Higgins Brick & Tile Co.	a	2217 W. 174th St., Torrance	Moneta
Dr. Leon N. Katz	a	9837 Foothill Blvd., San Fernando	Sunland
Sun Valley Tile Kilns	a	1258 N. Highland Ave., Los Angeles	Reseda
Valley Brick & Supply Co.	a	6151 Kester Ave., Van Nuys	Van Nuys
Marin County			
L. P. McNear Brick Co.	a	P.O. Box 119, San Rafael	McNear Point
The McNear Co.	k	P.O. Box 119k, San Rafael	McNear Point
Mono County			
Huntley Industrial Minerals Inc.	c	P.O. Box 305, Bishop	Laws
Orange County			
Burris Sand Pit, Attn. C. H. Townsend, Jr.	a	15293 E. Anaheim-Olive, Anaheim	Anaheim
California Non-Metallics	c, i	P.O. Box 265, Trabuco Canyon	El Toro
La Bolsa Tile Co.	a	R.F.D. 18404 Gothard St., Huntington Beach	Smeltzer
Pacific Clay Products Co.	a	1255 W. Fourth St., Los Angeles	Irvine
W. A. Schoeppe Clay Co.	c, i	P.O. Box 101, El Toro	El Toro
Placer County			
Gladding, McBean & Co.	f	2901 Los Feliz Blvd., Los Angeles 39	Lincoln
Lincoln Clay Products Co.	f	P.O. Box 367, Lincoln	Lincoln
Riverside County			
Atlas Sewer Pipe Co.	a	10009 S. Painter St., Whittier	Corona
Corona Clay Co., (Joe Deleo, Jr.)	a	1233 Garretson Ave., Corona	Temescal Canyon
Elsinore Clay Co.	f	Highgrove	Elsinore
Gladding, McBean & Co.	a, f	2901 Los Feliz Blvd., Los Angeles	Corona, Elsinore
Liston Brick Co.	a	P.O. Box 7, Corona	Corona
Los Angeles Brick & Clay Products Co.	a, f	2310 E. Seventh St., Los Angeles 23	Alberhill
Pacific Clay Products Co.	f	1255 W. Fourth St., Los Angeles	Corona

Sacramento County			
Cannon Co.	a	Box 802, Sacramento 4	Ben Ali & Michigan Bar
Robideaux, J. J.	f	4805 Yosemite Ave., Sacramento	Michigan Bar
Sacramento Brick Co.	a	P.O. Box 843, Sacramento 4	Sacramento
San Benito County			
Lewis, C. Hyde	b	Idria	Idria
San Benito Clay & Mineral Co.	b	111 Brookside Ave., San Jose	Tres Pinos
San Bernardino County			
B. & W. Tile Mfg. Co.	d	14600 S. Western Ave., Gardena	Ivanpah
J. S. Barrett	b	1230 St. Gertrude Place, Santa Ana	Yermo
Baroid Sales Division National Lead Co.	b	P.O. Box 1675, Houston 1, Texas	Hector
Brown Minerals Co.	b	Vidal, California	Vidal
Gladding, McBean & Co.	d	2901 Los Feliz Blvd., Los Angeles	Goffs
Hancock Brick Co.	a	Highgrove	Highgrove
Inerto Co.	b	1489 Folsom St., San Francisco	Newberry
Pomona Brick Co.	a	P.O. Box 239, Pomona	Chino
Shale-Lite Corp.	k	4846 Azusa Canyon Rd., Irwindale	Chino
Southern California Minerals Co., W. K. Skeoch	d	320 S. Mission Rd., Los Angeles 33	Baker
San Diego County			
Hazard Block Co.	a	Cabrillo Freeway and Friars Rd., Mission Valley, San Diego	San Diego
Sorrento Brick & Clay Products, Inc.	a	P.O. Box 183, Sorrento	San Diego
Union Brick Co.	a	7351 Pacific Highway, San Diego 9	Rose Canyon
San Joaquin County			
Pacific Clay Products Co.	f	1255 W. Fourth St., Los Angeles	Tracy
Stockton Brick & Tile Co.	a	P.O. Box 547, Stockton	Stockton
Stockton Building Materials	a	711 S. Madison St., Stockton 4	Stockton
San Luis Obispo County			
San Luis Brick, Inc.	a	2900 Broad St., San Luis Obispo	San Luis Obispo
Santa Barbara County			
McNall Building Materials	a	P.O. Box 187, Santa Barbara	San Marcos

Clay—Continued

Operator	Product*	Address	Location
Santa Clara County			
Gladding Bros. Mfg. Co.	a	O.P. Box 88, S. Third & Keyes St., San Jose 12	San Jose
Remillard-Dandini Co.	a	Storey Rd., San Jose	San Jose
Solano County			
Basalt Rock, Co., Inc.	k	Eighth and River Sts., Napa	Chabot Acres
Sonoma County			
A. J. Snodgrass	a	Rt. 1, Box 32 A1, Calistoga	Mark West
Stanislaus County			
Kraftile Co.	f	P.O. Box 2907, Fremont	Le Grange
E. H. Metcalf Materials	f	P.O. Box 1069, Livermore	Cooperstown
Clayton and Lester Raggio	f	Box 27, Knights Ferry	Cooperstown
Sutter County			
Gladding, McBean & Co.	a	2901 Los Feliz Blvd., Los Angeles	Nicolaus
Tulare County			
S. P. Brick Co.	a	P.O. Box 568, 926 Parallel Ave., Fresno	Exeter
Ventura County			
Ridgelite Products, Inc.	k	650 S. Grand Ave., Suite 1414, Los Angeles	Frazier Park
Rocklite Products	k	1800 N. Ventura Ave., Ventura	Ventura
Yuba County			
Gladding, McBean & Co.	a	2901 Los Feliz Blvd., Los Angeles	Wheatland

* a, Miscellaneous clay; b, Bentonite; c, Kaolin or china clay; d, Ball clay; e, Diatomaceous clay; f, Fire Clay; g, Fullers earth; h, Oil well drilling mud; i, Fire sand and ganister; j, Adobe brick; expansible shale.

Coal

Operator	Address	Location
Amador County		
American Lignite Products Co.	Ione	Ione

Copper *

Mine	Operator	Address	Location
Humboldt County			
Copper Bluff	Celtor Chem. Corp.	1686 Union St., San Francisco	Hoopa
Inyo County			
Pine Creek	Union Carbide Nuclear Co., Division of Union Carbide Corp.	Rm. 2115, 30 E. 42d St., New York 17	Bishop
Santa Rosa	Thomas D. Norris, et al	P.O. Box 111, Keeler	Keeler
Madera County			
Jesse Belle	Fresno Land Development Co.	440 Blackstone Ave., Fresno	Daulton
Shasta County			
Iron Mountain	Mountain Copper Co., Ltd.	230 California St., San Francisco 4	Redding

* Principal copper producers (not less than 10,000 pounds).

Diatomite (Diatomaceous Earth)

Operator	Address	Location
Kern County		
Excel-Mineral Co.	3451 E. 26th St., Los Angeles 23	Buttonwillow
Napa County		
Basalt Rock Co., Ltd.	Eighth and River Sts., Napa	Napa
Santa Barbara County		
Airox Company	307 W. Eighth St., Los Angeles 14	Casmalia
Great Lakes Carbon Corp., Dicalite Division	612 S. Flower St., Los Angeles 17	Lompoc
Johns-Manville Products Corp.	22 E. 40th St., New York, N. Y.	Lompoc
Wyandotte Chemical Corp.	1609 Biddle Ave., Wyandotte, Michigan	Lompoc

Feldspar

Operator	Address	Location
Monterey County		
Del Monte Properties Co.	P.O. Box 150, Pacific Grove	Pacific Grove
Owens-Illinois	P.O. Box 1035, Toledo 1, Ohio	Pacific Grove
San Bernardino County		
Gladding, McBean & Co.	2901 Los Feliz Blvd., Los Angeles 26	Atolia

Fluorspar

Operator	Address	Location
San Bernardino County		
Pacific Fluorite Co.	Valley Wells, via Nipton	Clark Mountain

Gold *

Mine	Type of mine**	Operator	Address	Location
Calaveras County				
Ione	c	C. F. Perrano	P.O. Box 741, Deming, New Mexico	----
El Dorado County				
Hazel Creek	a	Hazel Creek Mining Corp.	P.O. Box 3508, North Sacramento	Sly Park
Fresno County				
Rockfield gravel plant	g	Kerkling and Slensker	1800 Dover St., Lakewood, Colorado	Friant
Inyo County				
Pine Creek	h	Union Carbide Nuclear Co., Div. of Union Carbide Corp.	Rm. 2115, 30 E. 42d St., New York 17, N. Y.	Bishop
Kern County				
Yellow Aster	a	4-D Mining Co.	Box 276, Johannesburg	Johannesburg
Los Angeles County				
San Gabriel Valley Placer	g	Azusa Rock and Sand Co.	P.O. Box 575, Azusa	Azusa
Mariposa County				
Hasloe	a	Hasloe Mining Co., Inc.	16610 Center Way, Guerneville	Coulterville
Red Banks	a	Chris Mills	c/o Bagley Store, Mariposa	Coulterville
Specimen	a	Mittie & Peron	Star Rt., Mariposa	Bagby
Nevada County				
Empire North Star group	c	New Verde Mines Co.	P.O. Box 1027, Grass Valley	Grass Valley
Empire-Star dump	f	R. F. Jones and Frank B. Gliko	c/o New Verde Mines, Box 1027, Grass Valley	Grass Valley
Red Ledge	a	Red Ledge Mines	4704-69th St., Sacramento	Washington
Sacramento County				
Del Paso rock plant	g	Macklin Equipment Co.	P.O. Box 7110, Sacramento	Perkins
Granite Construction Co., pit	g	Granite Construction Co.	P.O. Box 156, Perkins	
Higgins Gravel Pit	g	Mrs. C. M. Craig	2457 Portola Way, Sacramento	Mills
Natomas	b	Natomas Co.	P.O. Box 1197, Sacramento	Folsom

Gold*—Continued

Mine	Type of mine**	Operator	Address	Location
Shasta County				
Oscar Davis property	d	Roy S. Olson	1178 Walnut Ave., Redding	Redding
Whisky Hill	a	Whisky Hill Mining Co.	Central Valley	Whiskeytown
Sierra County				
Brush Creek	a	Best Mines Co., Inc.	P.O. Box 177, Downieville	Downieville
Espy	d	Espy Mining Co.	P.O. Box 43, Nevada City	Pike
Kate Hardy	a	Kate Hardy Mining Co.	Box 748, Grass Valley	Forest
Original 16 to 1	a	Original 16 to 1 Mine, Inc.	235 Montgomery St., San Francisco	Alleghany
Siskiyou County				
Mississippi	d	A. O. Schwartz	Fort Jones	Seiad Valley
Siskon	a	Siskon Corp.	Box 148, Happy Camp	Happy Camp
Yuba County				
Browns Valley group (Dannebroge)	a	C. C. Butler & M. R. Smethurst	P.O. Box 1027, Grass Valley	Browns Valley
Yuba Unit	b	Yuba Consolidated Gold Fields, Div. Yuba Consolidated Industries, Inc.	351 California St., San Francisco	Hammonton
Yuba Unit Old Tailings	e	Electronics Mining and Equipment Co.	460 River Rd., Yuba City	Marysville

* Of 155 gold producers, only producers of 100 ounces or more are listed here.
** a, Lode gold mine; b, Bucket line dredge; c, Cleanup, final; d, Dragline dredge; e, Electrostatic separation; f, Dump; g, Aggregate plant; h, Tungsten mine.

Gypsum

Operator	Address	Location
Alameda County		
Westvaco Mineral Products Division, Food Machinery & Chemical Corp.*	P.O. Box 337, Newark	Newark
Imperial County		
United States Gypsum Co.	300 W. Adams St., Chicago, Ill.	Plaster City
Kern County		
Agricultural Gypsum Mine, C. L. Fannin	Rt. 1, Box 7, Wasco	Lost Hills
H. M. Holloway	714 Sixth St., Wasco	Lost Hills
Landson Mining Co.	P.O. Box 655, Maricopa	Maricopa
Starr Gypsum Co.	516 Sperry St., Bakersfield	--
Sunset Agricultural Minerals	1629 S. Union Ave., Bakersfield	Taft
Superior Gypsum Co.	3911 Pierce Rd., Bakersfield	Bitterwater Creek
Temblor Gypsum Co.	Carrizo Plains Star Rt., Box 80, Santa Margarita	Belridge
Kings County		
McPhaill Gypsum Co.	P.O. Box 927, Visalia	Avenal
Merced County		
Agricultural Mineral & Fertilizer Co., A. D. Sousa	P.O. Box 832, Los Banos	Los Banos
Riverside County		
United States Gypsum Co.	300 W. Adams St., Chicago 6, Ill.	Midland
San Luis Obispo County		
Superior Gypsum Co.	3911 Pierce Rd., Bakersfield	Carrizo Plains
Santa Barbara County		
De Weese Spreader, Inc.	P.O. Box 47, Earlimart	Ventucopa
Ventura County		
Monolith Portland Cement Co.	Box 65947, Glassell Sta., Los Angeles 65	Quatal Canyon

* Output not included in production figures, as gypsum is by-product of chemical process using minerals already included in state total.

Iodine

Operator	Address	Location
Los Angeles County		
Deepwater Chemical Co., Ltd.	Box 588, Compton	Compton
Western Division, The Dow Chemical Co.	Midland, Michigan	Long Beach, Venice, and Seal Beach
Orange County		
Western Division, The Dow Chemical Co.	Midland, Michigan	Seal Beach

Iron Ore

Mine	Operator	Address	Location
Riverside County			
Eagle Mountain	Kaiser Steel Corp.	Box 217, Fontana	Desert Center
San Bernardino County			
Iron Age	Iron Age Mines Co.	Twentynine Palms	Amboy

Lead *

Mine	Operator	Address	Location
Inyo County			
Defense	Foreman & Foreman	Sheridan, Montana	Panamint Springs
Queen of Sheba	J. R. Sanchez	3366 22d St., San Francisco	Warm Springs
Santa Rosa	Paul Bare	P.O. Box 538, Lone Pine	Darwin

* Principal producers only (production not less than 10,000 pounds).

Lime, Limestone,* Dolomite, and Shells

Operator	Type of product	Address	Location
El Dorado County			
California Rock & Gravel Co.	a, b	1800 Hobart Bldg., San Francisco	Cool
Diamond Springs Lime Co.	a, b	Box 409, Diamond Springs	Diamond Springs and Cool
El Dorado Lime Co.	a, d	Shingle Springs	Shingle Springs
Imperial County			
Don Weaver	a	Jucumba	Painted Gorge
Inyo County			
West End Chemical Co., Div. of Stauffer Chemical Co.	b	1956 Webster St., Oakland 12	Westend
Kern County			
Kennedy Minerals Co.	a	2550 E. Olympic Blvd., Los Angeles	Isabella
Mineral Materials Co.	a	1145 Westminster Ave., Alhambra	Frazier Park
Monterey County			
Kaiser Aluminum & Chemical Corp.	b, c	Box 1531, Salinas	Natividad
Orange County			
Shellmaker, Inc.	e	Coast Highway, Newport Beach	Newport Bay
San Benito County			
Westvaco Mineral Products, Div. of Food Machinery & Chemical Corp.	b	P.O. Box 337, Newark	Hollister
San Bernardino County			
Calco Milling Corp.	a	P.O. Box 505, Victorville	Hinkley
California Dolomite Co., Inc.	c	3105 Wilshire Blvd., Los Angeles	Kramer
California Portland Cement Co.	b	612 S. Flower St., Los Angeles	Colton
Kennedy Minerals Co.	a	2550 E. Olympic Blvd., Los Angeles	Cushenbury Canyon
Oro Grande Lime & Stone Corp.	b	2066 Hyde Park Blvd., Los Angeles	Colton
Permanente Cement Co.	a	Lucerne Valley	Lucerne Valley
Prehler Limestone Products Co.	a	433 S. Spring St., Los Angeles	Wrightwood, Cushenbury Canyon
Victorville Lime Rock Co.	a	Box 548, Victorville	Victorville

Lime, Limestone,* Dolomite, and Shells—Continued

Operator	Type of product	Address	Location
San Luis Obispo County			
Eaton and Smith	a	1215 Michigan Ave., San Francisco 7	Lime Mountain
San Mateo County			
Pioneer Shell Co.	e	448 Virginia Ave., San Mateo	--
South Bay Dredging Co.	e	Rt. 1, Box 78, Brentwood	San Francisco Bay
Santa Clara County			
South Bay Dredging Co.	e	Rt. 1, Box 78, Brentwood	Palo Alto
Santa Cruz County			
Pacific Limestone Products Co.	a, d	P.O. Box 468, Santa Cruz	Santa Cruz
Tuolumne County			
U. S. Lime Products	a, b, c	2244 Beverly Blvd., Los Angeles 27	Sonora, Columbia
Ventura County			
Western Lime Products	a	520 Mission St., South Pasadena	Santa Susana

* Limestone other than that used in cement: a—limestone, b—lime, c—dolomite, d—agricultural limestone, e—shell.

Lithium Salts

Operator	Address	Location
San Bernardino County		
American Potash & Chemical Corp.	3000 W. Sixth St., Los Angeles 54	Trona

Magnesium Compounds

Operator	Address	Location
Alameda County		
Westvaco Mineral Products Div., Food Machinery & Chemical Vorp.	P.O. Box 337, Newark	Newark
Monterey County		
Kaiser Aluminum & Chemical Corp. (oxide)	Moss Landing	Moss Landing
San Diego County		
Westvaco Mineral Products Div., Food Machinery & Chemical Corp.	P.O. Box 337, Newark	Chula Vista
San Mateo County		
Marine Magnesium Products Div., Merck & Co. (carbonate, hydroxide, and oxide)	E. Grand Ave., South San Francisco	South San Francisco

Magnesite

Operator	Address	Location
Santa Clara County		
G. E. McKinney	Star Rt., Box 39, Livermore	Red Mountain

Mine	Operator	Address	Location
Humboldt County			
Queens Peak	Carl Macela and Into Werta	P.O. Box 476, Garberville	Garberville
Imperial County			
Bright Star	George Ringwalt	Box 1111, Blythe	Palo Verde
Chipmunk and Mary Ellen	Charles K. Mills	Gen. Del., Palo Verde	Palo Verde
Jet Black	Minerals Exploit Co.	510 N. Fourth St., Blythe	Palo Verde
Mary Ellen No. 1	H. C. Gibson	1681 E. Main, Brawley	Palo Verde
Pioneer	Gene DeZan	926 E. Ave. B, Blythe	Palo Verde
Tadpole	Walter D. Scott	Star Rt., Ripley	Palo Verde
Tadpole	W. L. Killebrew	510 N. Fourth St., Blythe	Palo Verde
Kern County			
Magna	Harrison Mining Co.	9415 Long Beach Blvd., Southgate	Randsburg
Lake County			
Toy Young	Tex Young Mines, Inc.	1000 S. Bayshore Blvd., San Mateo	Lake Pillsbury
Mendocino County			
Foster Mountain	R. L. Wallace & R. H. Ellison	P.O. Box 105, Willits	Ukiah
Plumas County			
Plumas	Myles Timmons	P.O. Box 11, Crescent Mills	Crescent Mills
Riverside County			
Arlington Group	Alfred Figueroa	Box 453, Blythe	Blythe
Arlington, Langdon, and Kyle	California Limestone Products	Rt. 1, Box 55, Blythe	Blythe
San Bernardino County			
Logan	Pioneer Mining Co.	1908 W. Holman, Alhambra	Newberry
Owl Hole	K. M. Bennett	252 Grand Pre Blvd., Playa Del Rey	Baker
Ruby J. (Black Magic)	Calzone Mining Co.	281 Maryland Parkway, Las Vegas, Nev.	Baker
San Luis Obispo County			
Johe Ranch (Barneburg)	Porter L. Jackman and Bob Bianchini	Rt. 1, Box 161-B, San Luis Obispo	Paso Robles
Stanislaus County			
Buckeye	American Manganese Mining Co.		Patterson
Buckeye and No. 23	J. E. McKinney		Patterson
Tehama County			
Manganese King	P. S. Saridakis		Red Bluff

Mercury (quicksilver)

Mine	Operator	Address	Location
Fresno County			
Little Mercy (Albireo)	Albert L. Prichard	P.O. Box 853, San Jose	Mercey Hot Springs
Kings County			
Dawson	Tom Fortini and Abe Thompson	1416 4th Almaden Rd., San Jose	Parkfield
Little Kings (Fredanna)	Roy Pierce and C. J. Peterson	124 Atkinson Lane, Watsonville	Parkfield
Lake County			
Abbott	C.O.G. Minerals Corp.	Box 548, Williams	Williams
Marin County			
Edward Bros. (Bentley Ranch)	Panco Mining Corp.	33 Karen Lane, Walnut Creek	Marshall
Gambonini	E. Turner and McFarland	2085 Western Ave., Petaluma	Marshall
Monterey County			
Patriquin	Ray Hackney and Fred Kreider	343 N. Central Ave., Glendale	Parkfield
Napa County			
James Creek	Andrew Payne	1220 Bissell, Richmond	Aetna Springs
James Creek	L. H. Crippen	1220 Bissell, Richmond	Aetna Springs
James Creek	E. H. Haczela	114 West, Cloverdale	Aetna Springs
James Creek	Frank Keel and John Figarello	630 Vendola Dr., San Rafael	Aetna Springs
Oat Hill	George and Russell Burgen	Gen. Del., Middletown	Aetna Springs
Oat Hill	W. T. Kritios	3118 W. Euclid, Stockton	Aetna Springs
Oat Hill	H. L. Capp	Box 41, Middletown	Aetna Springs
San Benito County			
Aurora and Camp No. 2	Leonard W. Knepper	P.O. Box 87, Idria	Idria
Florence Mack	Electronic Minerals and Development Co.	P.O. Box 269, Santa Clara	Hernandez
Juniper	Cal-Merc Mining Co.	P.O. Box 637, Hollister	Paicines
Los Picachos	Highland Quicksilver, Inc.	P.O. Box 896, Coalinga	Hernandez
Matthews	H. A. Hickey	2069 S. Torrence, Napa	--
New Idria	New Idria Mining & Chemical Co.	P.O. Box 87, Idria	Idria
San Carlos & Ranchita	Leonard W. Knepper	P.O. Box 87, Idria	Idria
Santa Margarita	Juan Carillo, Sr.	Bitterwater Rd., King City	Idria
Turkey Hill	R. A. Fones	3330 E. First St., Livermore	Paicines

Mercury (quicksilver)—Continued

Mine	Operator	Address	Location
San Luis Obispo County			
Buena Vista	Harold Biaggina	P.O. Box 943, Atascadero	Adelaida
Khan dump	Ben Rutledge	609 Fourth St., Paso Robles	Adelaida
Rinconada	H. C. Dalessi	Box 465, San Luis Obispo	Santa Margarita
Santa Barbara County			
Gibralter (Falcon)	Gibralter Mining Co.	Box 216, Paramount	Santa Barbara
Santa Clara County			
Guadalupe	Palo Alto Mining Co.	14900 Coleman Rd., San Jose 24	San Jose
New Almaden	San Balderama	Almaden	Almaden
New Almaden	L. Brambila	Almaden	Almaden
New Almaden	Crystal Ball Mining Co.	21660 Bertram Rd., San Jose	Almaden
New Almaden	W. Goodman	21660 Bertram Rd., San Jose	Almaden
New Almaden	Escover Construction Co.	13004 Paso Presada, Saratoga	Almaden
New Almaden	Gish Brothers	455 S. 12th St., San Jose	Almaden
New Almaden (Dry Gulch)	Edgar T. Haun	2031 Jonathan Rd., San Jose	Almaden
New Almaden	Harold Hughes	Rt. 1, Box 176, San Martin	Almaden
New Almaden	K. & P. Mining	P.O. Box 91, San Jose	Almaden
New Almaden	Theron Kidd	Almaden	Almaden
New Almaden	Jose Lopez	Almaden	Almaden
New Almaden	Harry Mobley	Rt. 1, Box 174, San Martin	Almaden
New Almaden	San Rodriques	Almaden	Almaden
New Almaden	Art Silva	Almaden	Almaden
New Almaden	Abe Thompson	Almaden	Almaden
New Almaden	Frank Thompson	Almaden	Almaden
New Almaden	Morris Turner	310 N. 21st St., San Jose	Almaden
New Almaden	Turner, Parr & Perry	310 N. 21st St., San Jose	Almaden
Sonoma County			
Buckman	Buckman Mines	1256 N. McLean, Memphis, Tenn.	Cloverdale
Ellabee & Eureka	Robert Osborne	Box 166, Hollister	Cloverdale
Mount Jackson	Sonoma Quicksilver Mines, Inc.	P.O. Box 226, Guerneville	Guerneville
Socrates	A. E. Blackner & Assoc.	328 Carillo St., Santa Rosa	--
Stanislaus County			
Adobe	Joseph Odermatt	P.O. Box 972, Patterson	Patterson
Trinity County			
Altoona	The Castella Corp.	983 Mills Bldg., San Francisco	Castle Creek

Molybdenum Ore

Mine	Operator	Address	Location
Inyo County			
Pine Creek	Union Carbide Nuclear Co., Div. of Union Carbide Corp.	30 E. 42d St., New York 17, N.Y. Attn. W. E. Smith	Bishop

Peat

Operator	Address	Location
Contra Costa County		
Delta Dredging Co.	Rt. 1, Box 35B, Brentwood	Frank's Tract
Vita Peat, Inc.	P.O. Box 255, Bethel Island	Frank's Tract
Modoc County		
Modoc Peat Moss Co.	P.O. Box 785, Winters	Likely
Orange County		
R. W. McLellan and Sons	151 Commercial Way, Costa Mesa	Costa Mesa
Peat Sales Co., D. M. Callis, Jr.	2807 Pinkerton Place, Riverside	Huntington Beach
Riverside County		
Morongo Corp.	2120 E. Foothill Blvd., Pasadena	

Perlite

Operator	Address	Location
Contra Costa County		
Kaiser Gypsum Co., Inc. (expanded)	1924 Broadway, Oakland 12	Antioch
Inyo County		
International Minerals & Chemical Corp. (crude)	2060 Hyde Park Blvd., Los Angeles 47	Fish Springs
Los Angeles County		
Kaiser Gypsum Co., Inc. (expanded)	1924 Broadway, Oakland	Long Beach
Marcus A. McClure Co. (expanded)	2416 Bedessen Ave., Los Angeles 22	Los Angeles
Panacalite Pacific, Inc. (expanded)	845 E. 60th St., Los Angeles 1	Los Angeles
Paramount Perlite Co., Inc. (expanded)	16236 S. Illinois, Paramount (P.O. Box 83)	Paramount
Redco, Inc. (expanded)	11831 Voss St., North Hollywood	North Hollywood
Perlite Popped Products (expanded)	12655 E. Imperial Hwy., Santa Fe Springs	Norwalk
Napa County		
Perlite Aggregates, Inc.	P.O. Box 153, St. Helena	St. Helena
San Diego County		
Harborlite Corp. (expanded)	P.O. Box 458, Escondido	Chula Vista

Platinum Group Metals

Operator	Address	Location
Sacramento County		
Natomas Company (dredge)	P.O. Box 1197, Sacramento	Folsom
Yuba County		
Yuba Consolidated Gold Fields Div., Yuba Consolidated Industries, Inc. (dredge)	Hammonton	Hammonton

Potash

Operator	Address	Location
San Bernardino County		
American Potash and Chemical Corp.	3000 W. Sixth St., Los Angeles 54	Trona
Santa Cruz County		
A. M. Blumer	465 California St., San Francisco	Davenport

Pumice, Pumicite, and Volcanic Cinders

Mine	Rock type	Operator	Address	Location
Fresno County				
South Dome	a	Fresno Pumi-Tile Co.	1508 Thesta St., Fresno	Friant
Imperial County				
Superlite	--	Aricolite Builders Supply Co.	P.O. Box BB, Calipatria	Calipatria
Inyo County				
Ray Gill & Donna	a	Crownite Corp.	6363 Wilshire Blvd., Los Angeles 48	Coso Junction
Van Loon	a	H. A. Van Loon	336 N. Main St., Bishop	Bishop
Kern County				
Calsilco claims	b	Calsilco Corp.	5201 Alhambra Ave., Los Angeles 32	Inyokern
Lake County				
Cinder Products Co.	c	Cinder Products Co.	P.O. Box 295, Santa Clara	Clearlake Oaks
V. V. Coleman	c	V. V. Coleman	Lower Lake	Clearlake Highlands
Volcanic ash pit	b	Rodger E. Hellgren	P.O. Box 420, Clearlake Highlands	Clearlake Highlands
Lassen County				
Mt. Lassen Cinder Co.	c	Mt. Lassen Cinder Co.	801 Mark St., Susanville	Norvell
Madera County				
Taylors	b	California Industrial Minerals Co.	P.O. Box 286, Friant	Friant
Elmer Erickson	a	Elmer Erickson	Box 267, Friant	Friant

Pumice, Pumicite, and Volcanic Cinders—Continued

Mine	Rock type	Operator	Address	Location
Modoc County				
H. P. Free	a	Glass Mt. Volcanite Co.	Tulelake	Tionesta
Ainshea Butte	c	Great Northern Railway	175 E. Fourth St., St. Paul, Minn.	Mammoth (Tionesta)
Tulelake Mill	a	U. S. Pumice Supply Co.	6331 Hollywood Blvd., Los Angeles	Newell
Mono County				
Benton pit	a	Cowan and McGraw	P.O. Box 1013, Bishop	Benton
Insulating Aggregates	a	Andrew Boyd	Box 572, Bishop	Bishop
Leevining Mill	a	U. S. Pumice Supply Co.	6331 Hollywood Blvd., Los Angeles	Leevining
Frank Sam	a	Featherock Inc.	6331 Hollywood Blvd., Los Angeles	Mono Craters
San Bernardino County				
Pisgah Crater pit	c	Atchison Topeka & Santa Fe	General Office Bldg., Topeka, Kan.	Ludlow
Kleen-Gro	a	John J. Ravese	P.O. Box 1048, Palm Springs	Hinkley
Shasta County				
	c	California Div. Highways		
H. H. Ranch	--	Harry and Ivy Horr	Horr's H. H. Ranch, Glenburn	Glenburn
Red Butte	c	Willis Sanford	Fall River Mills	McArthur
Siskiyou County				
Bowen, DeBoy, Rebecca pits	c	Siskiyou Stone, Inc.	P.O. Box 187, Yreka	Yreka
Long Haul	a	Glass Mountain Block Inc.	Box 10, Tulelake	Tionesta
Cinder pit	c	Lava Bed National Monument	National Park Service, Region IV, Tulelake	Mammoth
Porcupine pit	c	McCloud River Lumber Co.	McCloud	Hambone
Shastalite	c	Shastalite Cinder Block Co.	300 N. Main St., Yreka	Yreka
Kegg cinder pit	c	Southern Pacific Co.	65 Market St., San Francisco 5	Kegg (Tionesta)
Thompson Pumice	a	Thompson Pumice Co.	12825 Sonoma Hwy., Glen Ellen	Tulelake
Whitt	a	James W. Whitt	P.O. Box 82, MacDoel	Medicine Lake

a, Pumice; b, pumicite or volcanic ash; c, volcanic cinders.

Pyrite

Operator	Address	Location
Shasta County		
The Mountain Copper Co., Ltd., L. T. T. Kett, Jr., Mgr.	230 California St., San Francisco 4	Matheson

Quartz, quartzite

Operator	Rock type	Address	Location
Inyo County			
Gladding, McBean & Co.	Qt	2901 Los Feliz Blvd., Los Angeles	Lone Pine
Kern County			
N. W. Sweetser	Vq	P.O. Box 445, Rosamond	Rosamond
Placer County			
Lowry Paving Company	Qc	2170 Oakdale Ave., San Francisco	Colfax
San Bernardino County			
Mineral Materials Co., C. W. Dunton, Mgr.	Qt	1145 Westminister Ave., Alhambra	Oro Grande
Sierra County			
Reno Silica Co.	Vq	1875 Daniel Webster Dr., Reno, Nevada	Purdy

Qt=quartzite
Qc=quartz, cobbles
Vq=vein quartz

Rare Earth Minerals

Operator	Address	Location
San Bernardino County		
Molybdenum Corp. of America	Mountain Pass via Nipton, California	Mountain Pass

Roofing Granules

Operator	Address	Type of stone
Calaveras County		
Altaville Aggregates	P.O. Box 266, Altaville	Rhyolite
Harley T. Kreth	Lancha Plana Rd., Ione	Miscellaneous stone
El Dorado County		
El Dorado Limestone Co., Inc.	Shingle Springs	Limestone
Placerville Slate Products Co.	P.O. Box 63, Placerville	Slate
Inyo County		
Inyo Marble Products	1060 Lillian Way, Hollywood	Marble
Kern County		
Desert Rock Milling Co. (Muy Doro 1-8)	974 Dale St., Pasadena	Miscellaneous stone
Desert Rock Milling Co. (Desert Rock Qys.)	974 Dale St., Pasadena	Miscellaneous stone
Mojave Rock Products	9452 E. Garvey, El Monte	Sandstone
Lake County		
Santa Clara Sand & Gravel Co.	P.O. Box 295, Santa Clara	Pumice
Los Angeles County		
Arco Rock Mills	12402 E. Los Nietos Rd., Los Nietos	Miscellaneous stone
Pyramid Rock Co.	113 N. Vineland Ave., La Puente	Granite
Monterey County		
Barnes Construction Co.	San Marino	Limestone
Kaiser Alum. Chem. Corp.	1940 Broadway, Oakland	Limestone
Seaside Sand & Gravel Co., Inc.	P.O. Box 513, Seaside	Miscellaneous stone
Riverside County		
Imperial Limestone Products, Inc.	1534 N. Hobart Blvd., Los Angeles	Limestone
H. T. Lucas Mining Co.	1534 N. Hobart Blvd., Los Angeles	Limestone
Kenneth J. MacKenzie	P.O. Box 133, Whitewater	Mica schist
Minnesota Mining & Mfg. Co.	Temescal Canyon, Corona	Volcanic rock
Snotop Rock Products Co.	P.O. Box 804, Santa Ana	Limestone
San Bernardino County		
Brubaker Mann Co.	30984 Soap Mine Road, Barstow	Miscellaneous stone
California Dolomite Co., Inc.	3105 Wilshire Blvd., Los Angeles	Limestone
Concrete Materials, Inc.	P.O. Box 434, Barstow	Gravel

Hammermilled Crushed Rock Co.	13555 Live Oak, Irwindale	Miscellaneous stone
Industrial Roofing Rock Co.	Camp Ono, San Bernardino	Limestone
Rainbow Rock, Inc.	P.O. Box 306, Barstow	Miscellaneous stone
Victorville Lime Rock Co.	P.O. Box 548, Victorville	Limestone
San Diego County		
Don M. Weaver (Volcan No. 1 & 2)	P.O. Box 174, San Diego	Basalt
Santa Clara County		
Mirassou Bros. (Lone Hill, Inc.)	15630 Harwood Road, Los Gatos	Rhyolite
Tuolumne County		
Lone Hill, Inc. (Deer Creek Qy.)	5310 Harwood Road, San Jose	Miscellaneous stone
Norman Tune	Highway 108, Twain Harte	Miscellaneous stone

Salt

Operator	Address	Location
Alameda County		
Oliver Bros. Salt Co.	P.O. Box 132, Mt. Eden	Mt. Eden
Leslie Salt Co.	505 Beach St., San Francisco 11	Newark and Mt. Eden
Kern County		
Western Salt Co.	2476 Hunter St., Los Angeles 21	Saltdale
Monterey County		
Monterey Bay Salt Works, E. C. Vierra, Mgr.	Box 43A, Moss Landing	Moss Landing
Orange County		
Western Salt Co.	P.O. Box 149, San Diego 12	Newport Beach
San Bernardino County		
California Salt Co.	2436 Hunter St., Los Angeles 21	Amboy
Metropolitan Water District of Southern California	306 W. Third St., Los Angeles 13	Rice
Pacific Salt & Chemical Co.	4262 Wilshire Blvd., Los Angeles	Trona
San Diego County		
Western Salt Co.	P.O. Box 149, San Diego 12	Chula Vista
San Mateo County		
Leslie Salt Co.	505 Beach St., San Francisco 11	Redwood City

Sand and Gravel

Operator	Address	Location
Alameda County		
Bell's Sand and Gravel Co.	P.O. Box 1487, Irvington	Irvington
California Rock & Gravel Co.	582 Market St., San Francisco	Pleasanton
Concrete Service Co.	860 Sunol St., San Jose	Sunol
Deetz Sand and Gravel Co.	743 Pleasanton Ave., Pleasanton	Pleasanton
Henry J. Kaiser Co.	1924 Broadway, Oakland 12	Centerville, Radum
Niles Sand & Gravel Co., Inc.	P.O. Box 155, Niles	Niles
Pacific Cement & Aggregates Inc.	400 Alabama St., San Francisco	Pleasanton, Centerville
Rhodes & Jamieson, Ltd.	333-23d Ave., Oakland	Centerville, Pleasanton
Thomas Construction Co.*	P.O. Box 683, Fresno	--
H. C. Thomsen Sand Dredging Co.	P.O. Box 403, Alameda	Alameda
A. C. Zaro Gravel Pit	301 Augustine St., Pleasanton	Pleasanton
Butte County		
Baldwin Construction Co., Inc.	P.O. Box 311, Marysville	Oroville Plt.
Butte Creek Rock Co.	P.O. Box 512, Chico	Chico
Henry J. Kaiser Co.	Kaiser Bldg., 1924 Broadway, Oakland 12	Oroville
Marler & Sons Rock Co.	4640 Virginia Ave., Oroville	Oroville
Mathews Readymix, Inc.	Rt. 1, Box 23, Gridley	Gridley
McCammon-Wunderlich*	P.O. Box 359, Palo Alto	--
Pentz Gravel, Attn: L. E. Wheelock	Durham	Pentz
Perry & Rowe Sand & Gravel	P.O. Box 247, Live Oak	Biggs Plant
Ralph Tarrant Trucking	1344 La Burnam St., Chico	Chico
Teichert Aggregates	E. First & Verbena Ave., Chico	Chico
Calaveras County		
I. L. Croft & Son*	P.O. Box 428, Saugus	
Jupiter Lumber Co.	Sonora	Vallecito
Neilsen's Gravel Plant	P.O. Box 457, San Andreas	San Andreas
Claude C. Wood Co.	P.O. Box 599, Lodi	Campo Seco
Colusa County		
Cortina Rock Products, Attn: Gene Godon	P.O. Box 357, Colusa	Colusa
Flores & Perry*	4643-11th Ave., Hanford	--
Goforth Bros., Attn: Jack Goforth	227 Fifth St., Williams	Williams
M. J. Ruddy & Son*	P.O. Box 3042, Modesto	--
Contra Costa County		
Moe Sand Co.	639 Embarcadero, Oakland	San Francisco Bay
Diablo Bldg., Material Inc.	1480 Monument, Concord	Concord

Charles Laws	585 Risdon Rd., Concord	Cowell
Morris Sand Pit, Attn: Ben Morris	Rt. 1, Box 659, Antioch	Antioch
Silver Sand Co., Attn: Julius L. Nelson	P.O. Box 5, Cowell	Cowell
Fay Wills Corp.	Rt. 1, Box 233, Antioch	Antioch
Del Norte County		
Anne Chapman	P.O. Box 2145, Klamath	Klamath
Pelican Bay Construction Service, Inc.	Smith River	Smith River
Simpson Redwood Co.	Box A, Klamath	Klamath
El Dorado		
Harms Bros.*	5261 Stockton Blvd., Sacramento	--
Chris Henningsen & Sons	30 Chapel St., Placerville	Placerville
J. T. White, Contractor	P.O. Box 24, Lake Tahoe	Tahoma
Fresno		
Anderson Rock Products	11000 N. Lanes Rd., Old Lanesbridge, Fresno	Fresno
Central Rock & Sand Co.	P.O. Box 425, Sanger	Sanger
Commercial Transfer Co.*	P.O. Box 431, Fresno	--
L. D. Folsom, Inc.	P.O. Box 347, Coalinga	Coalinga
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Rockfield
Rice Bros.*	P.O. Box 567, Fresno	--
River Rock Products	P.O. Box 1319, Fresno	Fresno
Sanger Rock & Sand	17125 E. Kings Canyon Rd., Sanger	Sanger
Stewart & Nuss, Inc.	410 Thorne Ave., Fresno	Fresno
Thomas Construction Co.*	P.O. Box 683, Fresno	--
Thompson Materials & Construction Co.	917 Dome St., Avenal	Coalinga
Volpa Bros.	233 Neilsen, Fresno 6	Friant
Channel Rock Plant	3143 Hwy. 99 South, Fresno	Sanger
San Joaquin Rock Co., Attn: C. Lage	1926 Michigan, Fresno	Fresno
Griffith Co.	1060 S. Broadway, Los Angeles 15	Pinedale
Glenn County		
Mack Rock & Sand Corp.	2325 Fern Ave., Chico	Chico
Orland Sand & Gravel Co.	P.O. Box 765, Orland	Orland
Southern Pacific Co.	65 Market St., San Francisco	Wyo (Orland)
Willows Ready Mix Concrete	Willows	Willows
Humboldt County		
A B S Aggregates, Inc.	P.O. Box 475, Arcata	Arcata
Arcata Sand & Gravel Co.	Rt. 3, Box 3009-B, Arcata	Arcata
D. J. Beasley	Phillipsville	Phillipsville
Blue Lake Sand & Gravel	Railroad & H, Blue Lake	Blue Lake
John Burman & Son*	3022 G St., Eureka	--
Delphia, Early & Crow*	P.O. Box 607, Patterson	--

Sand and Gravel—Continued

Operator	Address	Location
Humboldt County—Continued		
Eureka Sand and Gravel Co., Inc.	1955 Hilfiker Ave., Eureka	Eureka
Norman Fadel*	P.O. Box 206, North Hollywood	--
Granite Construction Co.*	Box 900, Watsonville	--
Tom Hull	930 Carson St., Eureka	Redwood Creek
Kadle Construction Co.	2277 River Road, Arcata	Arcata
Jesse Manley	RFD No. 1, Box 112, Arcata	Arcata
McIntosh & McKnight Ready Mix Co.	Willow Creek	Willow Creek
McWhorter & Dougherty, Inc.	P.O. Box 542, Fortuna	Fortuna
Mercer Frazer Co., Inc.	Second and Commercial Sts., Eureka	Arcata
Morrison-Knudsen*	411 W. Fifth St., Los Angeles	--
Rio Dell Gravel	Rio Dell	Rio Dell
Domingo Silva	Blue Lake	Blue Lake
Arthur B. Siri, Inc.	1357 Cleveland St., Santa Rosa	Arcata
Rock Products Division of Truck Lease Corp.	550 El Camino Rd., Menlo Park	Alton
Robert Stewart	P.O. Box 687, Arcata	Eureka
Imperial County		
Farmers Gravel Co.	18404 Gothard St., Huntington Beach	Huntington Beach
H. C. Gibson	Box 1278, Brawley	Brawley
Janney Sand & Gravel, Attn: Wayne Janney	1886 Walnut Ave., Yuma, Arizona	Winterhaven
J. L. McElvany	P.O. Box 818, El Centro	El Centro
J. B. Nelson, Attn: H. F. Nelson	Holtville	Holtville
R. T. Pinner & Son	P.O. Box 115, Brawley	Brawley
Valley Transit Cement Co., Inc.	P.O. Box 1489, El Centro	Brawley
Inyo County		
Bishop Engineering & Const., Inc.	P.O. Box 505, Bishop	Bishop
Hiatt's Sand & Gravel Co.	362 E. Clarke St., Bishop	Bishop
Lowe & Watson*	1265 Kendall Dr., San Bernardino	--
Kern County		
Guy F. Atkinson*	P.O. Box 593, South San Francisco	--
J. W. Brown Rock Plant	117 Taylor, Taft	Taft
Cal Rock Co.	P.O. Box 810, Bakersfield	Bakersfield
Dicco, Inc.	Bin 217, Station A, Bakersfield	Bakersfield
Edison Sand Co.	118 34th St., Bakersfield	Bakersfield
Ralph B. Ellis*	8240 Lankershim Blvd., North Hollywood	--

Griffith Co.	P.O. Box 175, Station B	Bakersfield
Willis B. Grossardt	430 Robertson Rd., Ridgecrest	Ridgecrest
Hartman Concrete Materials Co.	P.O Box 1632, Bakersfield	Bakersfield
Kern Rock Co.	P.O. Box 1697, Bakersfield	Bakersfield and Wheeler Ridge
Phoenix Construction Co., Inc.	1601 South Union Ave., Bakersfield	Bakersfield
River Rock Co.	P.O. Box 65, Oildale	Oildale
Terminal Construction Co.	6851 E. Ave. T, Littlerock	Littlerock
Triangle Rock Co.	330 Live Oak Ave., Arcadia	Arcadia
Webster Sand, Inc.	P.O. Box 271, Bakersfield	Bakersfield
Lake County		
Baun Construction Co.*	P.O. Box 4057, Fresno	--
Cache Creek Gravel Co.	Box 597, Clearlake Highlands	Clearlake
F. M. Frazell	P.O. Box 914, Lakeport	Kelseyville
Marion R. Chiselin	Clearlake Oaks	Clearlake
Rodger E. Hellgren	P.O. Box 420, Clearlake Highlands	Clearlake Highlands
Lange Bros., Attn: Harry Lange	P.O. Box 66, Lakeport	Kelseyville
H. L. McCabe	P.O. Box 66, Upper Lake	Upper Lake
Wright Bros.	Rt. 1, Box 226, Gridley	--
Los Angeles County		
Ada Equipment Rentals	2209 Bellflower Blvd., Long Beach	--
Arrow Rock Co.	16382 E. Live Oak Ave., Arcadia	Duarte
Arrow Sand & Gravel	P.O. Box 75, Palmdale	Palmdale
Azusa Rock & Sand Co.	P.O. Box 575, Azusa	Azusa
Bill & Rudy's Sand and Gravel	P.O. Box 1096, Walteria	Walteria
Blue Diamond Corp.	1650 S. Alameda St., Los Angeles	Little Rock, Sun Valley, Irwindale, Monrovia
California Materials Co.	P.O. Box 110, Whittier	Sun Valley
C & R Sand Co.	3467 Greenfield Ave., Los Angeles	El Segundo
Chandler's Palos Verdes Sand & Gravel Co., Attn: L. H. Chandler	P.O. Box 295, Lomita	Lomita
Consolidated Rock Products Co.	2730 S. Alameda St., Los Angeles 54	Azusa, North Hollywood, Irwindale, Monrovia, Sun Valley
John M. Ferry	5201 San Fernando Rd., Glendale 3	Littlerock
Graham Brothers, Inc.	5500 N. Peck Rd., El Monte	Irwindale
Granite Materials Co.	12455 Wicks St., Sun Valley	Sun Valley
Ladd Sand & Gravel Co.	14177 Foothill, San Fernando	Castaic
Lindauer Corp.	P.O. Box 337, La Habra	La Habra
Livingston Rock & Gravel Co., Inc.	11382 E. Live Oak Ave., Arcadia	Kincaid and Sunland
Manning Bros. Rock & Sand Co.	P.O. Box C, Irwindale	Irwindale
Osborn Company	1443 N. Edgecliff Lane, Pasadena 8	Pasadena
Owl Rock Products Co.	P.O. Box 509, Compton	Compton, Irwindale
Pacific Rock & Gravel Co.	P.O. Box 778, Arcadia	Irwindale

Sand and Gravel—Continued

Operator	Address	Type of stone
Los Angeles County—Continued		
Reid's Canoga Building Center	21355 Sherman Way, Canoga Park	--
Saugus Rock Products, Inc.	Rt. 4, Box 19, Saugus	Saugus
Edw. Sidebotham & Son, Inc.	751 E. L St., Wilmington	Lomita
Sierra Rock & Gravel Co.	P.O. Box 125, Artesia	Irwindale
C. O. Sparks, Inc. & Mundo Engineering Co.	1711 S. Soto St., Los Angeles 23	Irwindale
Terminal Rock & Sand Co.	6851 E. T, Littlerock	Littlerock
Torrance Sand & Gravel Corp.	25701 Crenshaw Blvd., Torrance	Torrance
Madera County		
Cerutti & Ghompson Transportation Co.	5110 Road 263¾, Madera	--
Woody Hefner	1029 N. D, Madera	--
Madonna Const. Co.*	P.O. Box 910, San Luis Obispo	--
San Joaquin Valley Pipe Co.	P.O. Box 215, Hwy. 99 N., Chowchilla	Chowchilla
Thomas Const. Co.*	P.O. Box 683, Fresno	--
Thompson Material and Construction Co.	917 Dome St., Avenal	Madera
Calif. Valley Feed & Fuel Co.	121 N. F St., Madera	Madera
Marin County		
Black Point Aggregates	P.O. Box 248, Niles	Black Point
Joslin Brothers	Point Reyes Sta.	Point Reyes Sta.
Mariposa County		
Fresno Paving*	4139 N. Valentine, Fresno	--
Harms Bros.	5261 Stockton Blvd., Sacramento 17	--
Kenneth Henley	Groveland	Groveland
Mariposa Sand & Gravel Co.	P.O. Box N, Mariposa	Mariposa
K. Mittrey*	15905 S. Broadway, Gardena	--
Mendocino County		
J. O. Archibald*	P.O. Box 968, Redwood City	--
Ball & Simpson*	300 Camille Ave., Danville	--
E. T. Baxman	Rt. 1, Box 633, Fort Bragg	Ten Mile River
Ellison Gravel Co.	112 Harold St., Fort Bragg	Manchester
Al Erickson*	P.O. Box 384, Napa	--
Ford Gravel Co.	P.O. Box 217, Ukiah	Ukiah
Frost & Fitzhugh	Willits	Willits
Granite Const. Co.*	Box 900, Watsonville	--
Huntington Bros.*	P.O. Box 446, Napa	--

Pete Persico	P.O. Box 516, Willits	Willits
Arthur B. Siri, Inc.	1357 Cleveland St., Santa Rosa	Ukiah
Sticker & Scott*	2110 W. Magnolia Blvd., Burbank	--
Ukiah Gravel & Cement Co., Inc.	P.O. Box 187, Ukiah	Ukiah
Willits Ready Mix	Rt. 1, Box 114, Willits	Willits
Merced County		
J. O. Broden	Shaffer Rd., Atwater	Winton
Cressey Sand & Gravel Plant	Rt. 2, Box 360, Merced	Merced
Le Grand Sand & Gravel, c/o Hanner Bros.	P.O. Box 232, Le Grand	Le Grand
Los Banos Mining Co.	P.O. Box 1111, Los Banos	Los Banos
Richardson Bros.	1224 Nevada, Los Banos	Los Banos
River Rock, Inc.	20 E. 15th St., Merced	Atwater and Snelling
M. J. Ruddy & Son*	P.O. Box 3042, Modesto	--
William Stockton	Los Banos	--
Turlock Rock Co.	P.O. Box 548, Turlock	Ballico
Valley Aggregates, Inc.	625 J St., Merced	Merced
Modoc County		
Moyer Gravel Co.	P.O. Box 25, Alturas	Alturas
H. Wright Bros.*	Rt. 1, Box 226, Gridley	--
Mono County		
I. L. Croft & Son*	P.O. Box 428, Saugus	--
Lowe & Watson*	1265 Kendall Dr., San Bernardino	--
Monterey County		
Stanton Biggs*	2825 N. Weber, Fresno	--
P. Calabrese Const. Co.	P.O. Box 1362, Monterey	Carmel Valley
Carmel Valley Rock & Adobe	P.O. Box 64, Carmel Valley	Carmel Valley
Delphia & Early*	P.O. Box 607, Patterson	Arroyo Seco
Granite Const. Co.	P.O. Box 900, Watsonville	Seaside, Carmel River
Healy Const. Co.*	P.O. Box 175, Palmdale	--
Harrison Const. Co.*	15065 Lashburn St., Whittier	--
Madonna Const. Co.*	P.O. Box 910, San Luis Obispo	Big Sur
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Lapis and Prattco
Fred Pfyffer	King City	Lonoak
Seaforth Corp.	Box 3091, Carmel	Marina
South County Sand and Gravel	Metz Rd., King City	Metz
Monterey Sand Co.	P.O. Box 928, Monterey	Seaside, Marina, Carmel Valley
Napa County		
Benson Gravel Plant	P.O. Box 341, Angwin	Pope Creek
E. A. Forde Co.	Box 306, San Anselmo	--
D. Ellsworth & Sons	1090 Summit, Napa	Napa
Walter M. Roderick	1891 Trancas, Napa	Napa

Sand and Gravel—Continued

Operator	Address	Location
Nevada County		
Clements Rock Products, Inc.	37350 Sequoia Rd., P.O. Box 667, Fremont	Truckee
Granite Const. Co.*	Box 900, Watsonville	--
Arlie O. & Karsten M. Hansen	Rt. 1, Box 472-L, Grass Valley	Grass Valley
Huntington Bros.*	P.O. Box 446, Napa	--
Orange County		
Beach Industrial Sand Co.	6811 Taylor Ave., Huntington Beach	Huntington Beach
Blue Diamond Corp.	1650 S. Alameda St., Los Angeles 54	El Modena
Burris Sand Pit, Attn: C. H. Townson, Jr.	P.O. Box 1741, Santa Ana	Anaheim
Certified Sands Inc.	7575 Jefferson, Anaheim	Anaheim
Consolidated Rock Prod. Co.	2730 S. Alameda St., Box 2950, Terminal Annex, Los Angeles 54	Orange and Yorba Linda
Foster Sand & Gravel Co.	915 S. Spadra Rd., Fullerton	Atwood
Graham Brothers, Inc.	5500 N. Peck Rd., El Monte	San Juan Capistrano
Graves Sand & Gravel Inc.	2203 S. Redwood Dr., Anaheim	Atwood
D. D. Lawhead & Sons	111 14th St., Seal Beach	Buena Park
McClellan & Sons	151 Commercial Way, Costa Mesa	Anaheim
Jim Longsdon Sand Plant	12281 E. Chapman Ave., Garden Grove	Garden Grove
Miller & Hansen Sand & Gravel	11732 S. Los Angeles St., Orange	Orange
R. J. Noble Co.	P.O. Box 620, Orange	Anaheim
Norwalk Asphaltic Concrete Inc.	Norwalk	Atwood
Orange County Rock Products	P.O. Box 125, Artesia	El Modena
C. L. Pharris (Trucking)	16252 E. Taft, Orange	Orange
Santiago Aggregates, Inc.	770 Black Star Canyon Rd., Orange	Orange
James Sparks Sand Pit	P.O. Box 585, Anaheim	Anaheim
Star Rock Products Co., c/o San Gabriel Ready-Mix	965 N. Fair Oaks Ave., Pasadena	Anaheim
Sully Miller Contracting Co.	P.O. Box 432, Orange	Orange
Placer County		
Bear River Sand and Gravel Co.	P.O. Box 606, Colfax	Colfax
Joe Chevreaux	P.O. Box 65, Station A, Auburn	Colfax
Deer Park Ready Mix	Box 77, Tahoe City	Tahoe City
Fredrickson & Watson Construction Co.	873 81st St., Oakland 3	Gold Run
Granite Const. Co.*	Box 900, Watsonville	Colfax
Roger C. Patterson	Route 1, Sheridan	--
Harold Porter Property	Bear River, Sheridan	Sheridan
Sheridan Sand & Gravel	P.O. Box 68, 13th & H St.	Sheridan
Sutherland Const. Co.*	P.O. Box 786, Auburn	--
R. J. Miles Co., Attn: M. Miles	P.O. Box 458, Colfax	Colfax

Plumas County		
Bellamy Corp. c/o C. W. Bellamy	P.O. Box 742, Quincy	Quincy
Freeman Fuel Co.	117 Commercial, Portola	Portola
Healy Const. Co.*	P.O. Box 175, Palmdale	--
E. G. Leonhardt	Chandler Rd., Quincy	Quincy
Plumas Readi-Mix Concrete	427 W. Main, Quincy	Quincy
T. W. Ramelli	Vinton	Vinton
Riverside County		
Corona Rock Prod. Qy.	1100 S. Veberly Dr., Los Angeles	Corona
Desert Hot Springs Ready Mix, Inc.	Box 286, Desert Hot Springs	Desert Hot Springs
Massey Rock & Sand Co.	P.O. Box 487, Indio	Indio
Matich Co.*	P.O. Box 390, Colton	--
Palm Springs Builders Supply Co., Ltd.	490 SunnyDunes Rd., Palm Springs	Palm Springs
San Gorgonio Rock Products	P.O. Box 1414 Hargrave St., Banning	Banning
Shepwells	P.O. Box 87, Blythe	Blythe
Silva & Hill Constr. Co.	1148 N. San Gabriel St., San Gabriel	Indio
Stanford J. Stelle	Box 1114, Indio	Indio
Triangle Rock Prod. Inc.	330 E. Live Oak, Arcadia	Mira Loma
Valley Rock & Sand Corp.	P.O. Box 926, San Jacinto	San Jacinto
Winston Bros.*	301 Clifton Ave., Minneapolis, Minn.	--
E. L. Yeager Co.*	P.O. Box 87, Riverside	--
Sacramento County		
Brighton Sand & Gravel Co.	P.O. Box 7001, Perkins Branch, Sacramento	Sacramento
Erickson Sand & Gravel	P.O. Box 1072, Sacramento	Sacramento
Fair Oaks Gravel Co.	4000 Illinois Ave., Fair Oaks	Fair Oaks
Granite Construction Co., c/o R. C. Solari	P.O. Box 7156, Perkins Station	Sacramento
Hard Materials Co.	P.O. Box 709, 12th St. & Vine Sts., Sacramento	Sacramento
McGillivray Construction Co.	P.O. Box 873, Sacramento 4	Sacramento
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Fair Oaks
Robert Powell Products, Inc.	P.O. Box 1412, 24th & American River, Sacramento	Sacramento
Robertson Sand & Gravel Co.	1061 Vine St., Sacramento	Sacramento
Teichert Aggregates	P.O. Box 928, Sacramento	No. Sacramento and Perkins
San Benito County		
Hollister Sand & Gravel Co.	Nash Rd., Hollister	Hollister
Don L. Rider	Cienega Rd., Hollister	Hollister
Thomas Const. Co.*	P.O. Box 683, Fresno	--
San Bernardino County		
Atlas Materials Co.	P.O. Box 429, Riverside	Bloomington
Base Rock Co. Inc.	P.O. Box 107, Claremont	Claremont
Big Bear Rock & Materials, Inc., Attn: Mr. Ed McClellan	P.O. Box 784, Big Bear Lake	Big Bear Lake

Sand and Gravel—Continued

Operator	Address	Location
San Bernardino County—Continued		
Canyon Rock Processing Co.	2006 N. Campus, Upland	Upland
Commercial Rock Co.	P.O. Box 722, Redlands	Colton
Concrete Materials, Inc.	P.O. Box 434, Barstow	Barstow
Consolidated Rock Prod. Co.	2730 S. Alameda St., Box 2950, Terminal Annex, Los Angeles 54	--
Dana Materials Co.	P.O. Box 187, Apple Valley	Daggett
Daniel-Dixon Co., Inc.	P.O. Box 106, Cross Roads	Cross Roads
J. R. Dial	P.O. Box 632, 412 "D" St., Needles	Needles
Fourth Street Rock Crusher	P.O. Box 469, San Bernardino	San Bernardino
Fredericksen & Kasler*	212 13th St., Sacramento	--
Gabriel Rock	W. Base Line at Lytle Crk., San Bernardino	San Bernardino
Hanawalts	4594 San Bernardino Ave., Ontario	Montclair
Hi-Desert Concrete Products Inc.	Box 755, Yucca Valley	Twentynine Palms
Holliday Rock Co.	P.O. Box 229, Claremont	Bloomington & Upland
Johnston Ready Mix Concrete & Barstow Rock & Gravel Co.	P.O. Box 808, Barstow	Barstow
Lucerne Valley Rock Products	P.O. Box 313, Lucerne Valley	Lucerne Valley
W. F. Maxwell Co.*	P.O. Box 356, Fontana	--
Matich Co.*	P.O. Box 390, Colton	--
Midway Building Materials	4531 W. Holt Blvd., Ontario	Montclair
Mountain Rock Products	915 S. Spadra Rd., Fullerton	Upland
Pacific Rock & Gravel Co.	1465 E. 16th St., Upland	Upland
San Bernardino Rock & Gravel Co.	1910 W. Seventh St., San Bernardino	San Bernardino
Service Rock Co.	P.O. Box 309, Riverside	Lytle Creek & Colton
Sullivan Brothers	5376 N. Adobe Rd., Twentynine Palms	Twentynine Palms
J. A. Thompson & Son*	P.O. Box 518, Inglewood	--
Triangle Rock Products, Inc.	330 E. Live Oak Ave., Arcadia	San Bernardino, Fontana
Tri-City Concrete	Alabama Redlands, San Bernardino	Redlands
Union Pacific R. R. Co.	1416 Dodge St., Omaha, Neb.	Basin
Winston Bros.*	301 Clifton Ave., Minneapolis, Minn.	--
E. L. Yeager Co.*	P.O. Box 87, Riverside	--
San Diego County		
Beeler Canyon Sand & Gravel Co.	2832 George St., Apt. 7, Los Angeles 27	Poway
Canyon Rock Co., Div. of V. R. Dennis Constr. Co.	P.O. Box 3158 Hillcrest Sta., San Diego	San Diego
Carlsbad Rock & Sand Inc.	P.O. Box 28, Lawrence Canyon, Oceanside	Oceanside
Caudell & Johnson	Box 3098. San Diego 3	Mission Valley and Poway
Crystal Silica Co.	Ottawa, Illinois	Oceanside
Daley Corporation	P.O. Box 4067, San Diego 4	Murphy Canyon

Denton Sand & Gravel, Attn: Ednon Denton	4166 Pepper Dr., San Diego 5	El Cajon and San Diego
Einer Bros. Inc., Attn: Mr. Einer, Jr.	P.O. Box 936, Escondido	Escondido
El Cajon Sand & Gravel Co.	640 Marshall Ave., El Cajon	El Cajon
Escondido Sand & Gravel Work	440 N. Tulip, Escondido	Escondido
H. G. Fenton Material Co.	P.O. Box 64 or 702 W. Washington St., San Diego	Murray Canyon, Mission Valley, Carroll Canyon
Gross Sand Co., Attn: Maurice N. Gross	P.O. Box 623, Lakeside	Lakeside
Jamacha Sand Plant, Inc.	Route 1, Box 653, El Cajon	El Cajon
Monarch Materials Co.	P.O. Box 64, San Diego 12	San Diego
Nelson & Sloan	P.O. Box 488, Chula Vista	Otay
H.W. Rohl Co., Inc.	P.O. Box 28, Lawrence Canyon, Oceanside	Oceanside
Santee Materials	Div. of V.R. Dennis Const. Co., Santee	Santee
Sierra Sand Co.	Rt. 2, Box 1095, Lakeside	Lakeside
Smith Construction Co.	P.O. Box 247, Rancho Santa Fe	Rancho Santa Fe
Sorrento Valley Road	Box 561, Del Mar	Del Mar
Sweetwater Sand Co.	5110 Sweetwater Rd., National City	National City
Waddington's Soil & Sand Lot	8246 Broadway, Lemon Grove	--
Woodward Sand Co.	P.O. Box 4006, San Diego 4	San Diego
Lou Zinniger Sand and Gravel	1230 Westview Dr., Encinitas	Rancho Santa Fe
San Francisco County		
Moe Sand Co.	639 Embarcadero, Oakland	San Francisco Bay
San Joaquin County		
Calaveras Rock Co.	22 N. San Joaquin, Stockton	Linden
S. M. McGaw Co., Inc.	307 Elks Bldg., Box 757, Stockton	Linden
Munn & Perkins	P.O. Box 1092, Modesto	Escalon
Nomellini & Funk	939 Marenga Rd., P.O. Box 1528, Stockton	Vernalis
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Tracy
Putnam Sand & Gravel Co., Inc.	200 Santa Rosa Ave., P.O. Box 486, Modesto	Riverbank
Teichert Aggregates	P.O. Box 928, Sacramento	Tracy
Claude C. Wood Co.	P.O. Box 599, Lodi	Clements
San Luis Obispo County		
Baun Const. Co.*	P.O. Box 4057, Fresno	--
Guiton Foundry Supply	P.O. Box 258, Oceano	Oceano
MacClosky Const. Co.*	15900 S. Broadway, Gardena	--
Madonna Const. Co.*	P.O. Box 910, San Luis Obispo	--
Morro Rock & Sand	P.O. Box 694, Morro Bay	Morro Bay
Ray Nelson	P.O. Box 525, Santa Maria	Santa Maria
Phoenix Const. Co.*	P.O. Box 906, Bakersfield	--
E. Wayne Price	Rt. 1, Box 652, Arroyo Grande	Arroyo Grande
Walter B. Roselip Co.	P.O. Box 458, Atascadero	Atascadero
Ted Watkins	P.O. Box 453, San Luis Obispo	Paso Robles

Sand and Gravel—Continued

Operator	Address	Location
Santa Barbara County		
Batastini Bros.	618 E. Gutierrez, Santa Barbara	Santa Barbara
Buellflat Rock Co.	Solvang-Buellton Rd., Solvang	Solvang
Coast Rock Prod. Inc.	P.O. Box 646, Santa Maria	Santa Maria
A. J. Diani Construction Co.	295 N. Bloser, Santa Maria	Goleta
Fredrickson & Watson Constr. Co.	873 81st St., Oakland 3	Buellton & Santa Barbara
H. G. Iliff & Son	P.O. Box 273, Santa Maria	Santa Maria
Missile City Sand Co.	P.O. Box 139, Lompoc	Santa Barbara
Nelson Brothers	Sweeny Rd., Lompoc	--
Southern Pacific Milling Co.	Santa Paula Rock Branch, P.O. Box 491	Sisquoc
West Coast Construction Co.	1101 W. Laurel, Lompoc	Lompoc
Santa Clara County		
Bayshore Rock Co.	Rt. 2, Box 553, Bayshore and Hallyer Ave., Morgan Hill	Morgan Hill
Brem's Gravel & Sand	211 Princevalle St., Gilroy	Gilroy
Louis Canha	Box 143, Catherine & Gold, Alviso	--
Cupertino Gravel Co.	605 W. Bayshore, Sunnyvale	--
Howson's Inc.	738 N. Monterey St., Gilroy	Gilroy
James Engineering	265 Lewis Rd., San Jose	--
Claude T. Kritzer	1086 Westwood Dr., San Jose	--
Los Gatos Sand & Gravel Co.	P.O. Box 502, Los Gatos	Los Gatos
Charles Moore	951 Hamline St., San Jose	--
Leo F. Piazza Paving Co.	985 Downer Ave., San Jose	San Jose
A. J. Raisch Paving Co.	900 W. San Carlos St., San Jose 26	San Jose
Reed & Graham, Inc.	690 Sunol St., San Jose	--
Renz Construction	671 First St., Gilroy	--
Santa Clara Sand & Gravel Co.	P.O. Box 295, Santa Clara-Alviso Rd., Santa Clara	San Jose
Carl N. Swenson Co.	1095 Stockton Ave., San Jose	Milpitas
Sondgroth	P.O. Box 1055, Mountain View	Stevens Creek
Terra Commercial	375 Umbarger Rd., San Jose	--
David Tonelli	10150 Clayton Rd., San Jose	--
Western Gravel Co.	Rail and Kennedy Aves., P.O. Box 1026, Campbell	Campbell
Western Tile & Supply Co., Attn: H. W. Jensen	P.O. Box 104, Gilroy	Gilroy
Xavier Sand & Gravel	Rt. 2, Dewitt Ave., Morgan Hill	Morgan Hill
Santa Cruz County		
Concrete Service Co.	860 Sunol St., San Jose	Scotts Valley
Graham & Son	500 Mt. Herman Rd., Santa Cruz	Santa Cruz
Henry J. Kaiser Co.	Kaiser Bldg., 1924 Broadway, Oakland 12	Felton

Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Felton
Santa Cruz Aggregates Co., Walter P. DuBois, Pres.	646 Lockhart Gulch Rd., Santa Cruz	Santa Cruz
United Builders & Farmers Supply	5601 Freedom Blvd., Soquel	--
Shasta County		
M. W. Brown	P.O. Box 827, Redding	Redding
T. B. Dodson Pit	Balls Ferry Rd., Anderson	Anderson
Gibbons & Reed Co.*	P.O. Box 2429, Salt Lake City, Utah	--
J. H. Hein Co.	P.O. Box 226, Redding	Redding
R. E. Hertel	2904 Regina Way, Sacramento	Burney
Lassen Sand & Gravel	Cassel	Cassel
Leland Kerns	Burney	Burney
Morgan Construction Co.	P.O. Box 904, Redding	Redding
Oaks Sand, Gravel & Cement Products Co., Attn: G. E. Oaks	P.O. Box 1847, Redding	Clear Creek
Redding Sand & Gravel Inc.	P.O. Box 741, Redding	Redding
Riley Trucking Co., Attn: Chas. W. Riley	P.O. Box 1462, Redding	Redding
J. H. Trisdale*	P.O. Box 779, Redding	--
Willis Sanford	Falls River Mills	Falls River Mills
Shea-Kaiser-MK-Macco-Raymond, JV	Whiskeytown	Redding
A. G. Valentine	Burney	Burney
Anderson Ready Mix	Rupert Lane, Anderson	Anderson
Sierra County		
Leon Dotta	Loyalton	Loyalton
Siskiyou County		
J. C. Compton	Box 86, McMinnville, Oregon	Klamath River
Gibbons & Reed*	P.O. Box 2429, Salt Lake City, Utah	--
McCammon-Winderlich*	P.O. Box 359, Palo Alto	--
Mt. Shasta Gravel Co.	P.O. Box 836, Mt. Shasta	Mt. Shasta
Eric E. Schoonemaker	Rt. 1, Box 356, Yreka	Happy Camp, Seiad, Ft. Jones
Wright Bros.*	Rt. 1, Box 226, Gridley	--
Albert Young	112 Fourth St., Yreka	Yreka
Solano County		
J. M. Brazelton	Pleasant Valley Rd., Vacaville	--
Parish Brothers, Inc.	1205 E. Second and L Sts., P.O. Box 6, Benicia	--
Connie Dominguez	Rt. 1, Box 62, Winters	Winters
Sonoma County		
Basalt Rock Co., Inc.	P.O. Box 540, Napa	Healdsburg
Cloverdale Ready Mix	P.O. Box 451, First St., Cloverdale	Cloverdale
Empire Rock Co., Inc.	3851 E. Montgomery Dr., Santa Rosa	Santa Rosa
Hein Bros. Basalt Rock Co.	P.O. Box 162, Petaluma	West Windsor

Sand and Gravel—Continued

Operator	Address	Location
Sonoma County—Continued		
Los Alamos Rock Co.	1000 Wildwood Dr., Santa Rosa	Santa Rosa
Marshall Maxwell, Inc.	1330 King St., Santa Rosa	Mirabel
Russian River Rock Co.	P.O. Box 254, Healdsburg	Healdsburg
Harvey Taylor Gravel Co.	523 Mason St., Healdsburg	Healdsburg
Trudell Rock Co.	700 West Side Road, Healdsburg	Healdsburg
Windsor Sand & Gravel	P.O. Box 145, Windsor	Windsor
Stanislaus County		
American Sand & Gravel Co., Inc.	2402 McHenry Ave., Modesto	Modesto
Graystone Block Sand Pit	316 River Rd., Modesto	Modesto
Hughson Gravel Plant, Attn: Ed Kleim	P.O. Box 35, Hughson	Hughson
Frank B. Marks, Jr.	P.O. Box 668, Newman	Newman
Modesto Sand & Gravel Co., E. H. Meyens, Pres.	P.O. Box 496, Salida	Salida
Putnam Sand & Gravel Co., Inc.	200 Santa Rosa Ave., P.O. Box 486, Modesto	Riverbank
George and Wendell G. Reed	529 Covena Ave., Modesto	--
Santa Fe Rock & Sand	P.O. Box 3042, Modesto	Modesto
Standard Materials	P.O. Box 3171, Modesto	Hughson
Standard Rock Co.	P.O. Box 696, Escalon	Escalon and Oakdale
Chas. D. Warner & Son, Inc.	1027 Yosemite Blvd., Modesto	Modesto
Sutter County		
Fredrickson Bros*	1259 65th St., Emeryville	--
Chester W. Stineman	Rt. 1, Box 10, Wheatland	Wheatland
Perry & Rowe	P.O. Box 297, Live Oak	Live Oak
Tehama County		
H. P. Edwards	P.O. Box 814, Red Bluff	--
Richard Ehorn & Trucking	124 S. Jackson, Red Bluff	--
Martin Brothers, Inc.	Highway 99W, Richfield	Richfield
Red Bluff Sand & Gravel Co., Attn: G. E. Oaks	P.O. Box 1847, Redding	Red Bluff
Starnes Sand & Gravel	P.O. Box 366, Gerber, Santa Rosa and Chipman Ave., Gerber	Gerber
Thomas Const. Co.*	P.O. Box 683, Fresno	--
Stephen L. Vistica*	70 N. El Camino Real, San Mateo	--
Allen & Reddy Sand & Gravel	P.O. Box 729, Red Bluff	Red Bluff
Trinity County		
C. E. Roberts & Son	363 E. Elm Ave., Coalinga	Lewiston
Trinity Sand & Gravel Co.	Weaverville	Douglas City

Tulare County		
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Lemon Cove
E. F. Quiram & Sons	406 Garden St., Porterville	Porterville
Sequoia Rock Co.	P.O. Box 217, Station A, Bakersfield	Porterville
Thomas Const. Co.*	P.O. Box 683, Fresno	--
Todd Rock & Sand Co., Arthur P. Todd	851 W. Morton, Porterville	Porterville
Visalia Sand Plant	P.O. Box 701, Visalia	Visalia
Fresno Paving*	4139 N. Valentine, Fresno	--
Tuolumne County		
Beerman & Jones	P.O. Box 698, Sonora	Sonora
Fredrickson Bros.*	1259 65th St., Emeryville	--
H. M. Stewart and V. S. Parthero	P.O. Box 8, Chinese Camp	--
Ventura County		
Clifford C. Bonz Co.*	123 N. Third Ave., Arcadia	--
P. W. Gillibrand	5131 Tapo Rd., Simi	Santa Susana
Independent Rock Co.	E. Telegraph Rd., P.O. Box 181, Santa Paula	--
Madonna Construction Co.	399 Freeway, P.O. Box 910, San Luis Obispo	Canet Ranch
Mission Rock Company	P.O. Box 408, Santa Paula	Santa Paula
Walter J. Saviers	P.O. Box 601, Moorpark	--
Simi Block & Sand Co.	7030 Canby Ave., Reseda	Moorpark
Southern Pacific Milling Co., Santa Paula Rock Co.	P.O. Box 491, Ventura	Montalvo, El Rio and Santa Paula
Consolidated Rock Products Co.	2730 S. Alameda St., Box 2950, Terminal Annex, Los Angeles 54	Saticoy
Yolo County		
Gordon H. Ball*	300 Camilla Ave., Danville	--
Isabella Woods Bouton	607 Hollister Rd., Woodland	Woodland
M. J. Cody	Winters, California	--
Granite Construction Co., c/o R. C. Solari, P.O. Box 7156	Perkins Station, Sacramento	Yolo
Pacific Cement & Aggregates, Inc.	400 Alabama St., San Francisco 10	Yolo
Schwarzgruber & Sons, Attn: Joe Schwarzgruber	28 W. Main St., Woodland	Yolo
Teichert Aggregates	P.O. Box 928, Sacramento 4	Yolo
Madison Sand & Gravel Co.	P.O. Box 66, Madison	Madison and Esparto
Yuba County		
Baldwin Contracting Co.	P.O. Box 311, Marysville	Hallwood and Yuba R.
H. Earl Parker, Inc.	12th and F Sts., Marysville	--
B. C. Richter	1955 Mitchel Ave., Oroville	--
Marysville Rock Products Co.	1312 Stafford Way, Yuba City	Marysville
Lester Rice & Son	235 Sumner St., P.O. Box 408, Yuba City	Marysville
Yuba River Sand Co.	P.O. Box 307, Marysville	Marysville

* Reported by Division of **Highways** as having produced sand and gravel for road purposes.

Sand, Specialty

Operator	Addres	Type of sand	Location
Amador County			
Ione Clay & Sand Corp. Attn: Maurice W. Powell, Atty.	1435 Alhambra Blvd., Sacramento	a	Ione
Owens-Illinois Gen. Offices, Attn: F. M. Canter, Asst. Compt.	P.O. Box 1035-1036, Toledo 1, Ohio	g	Ione
Calaveras County			
Pacific Clay Products	1255 W. Fourth St., Los Angeles	g	Camanche
Richmond Rock Wool Co.	1050 Brookside Dr., Richmond	b	Copperopolis
Contra Costa County			
Marchio Silica Sand Co.	Rt. 1, Box 1386, Antioch	f	Antioch
Los Angeles County			
Bill & Rudy's Sand and Gravel	P.O. Box 1096, Walteria	b	Walteria
Caswell & Co.	2357 E. Slauson Ave., Los Angeles 58	m	Torrance
Gordon Sand Co.	P.O. Box 128, El Segundo	m, b, e	El Segundo
Monterey County			
Del Monte Properties Co. Sand Div.	P.O. Box 150, Pacific Grove	m, g	Pacific Grove
Monterey Sand Co.	P.O. Box 928, Monterey	b, e, fl	Seaside
Owens-Illinois Gen. Offices, Attn: Floyd M. Canter, Asst. Comp.	P.O. Box 1035-1036, Toledo, Ohio	g	Pacific Grove
Pacific Cement & Aggregates	400 Alabama St., San Francisco	b, e	Lapis & Pratico
Seaside Sand & Gravel Co., Inc.	P.O. Box 513, Marina	b	Marina
Orange County			
Beach Industrial Sand Co.	6811 Taylor Ave., Huntington Beach	b	Huntington Beach
Nonmetallics	P.O. Box 265, Trabuco Canyon	f	Trabuco Canyon
W. A. Schoeppe Clay Co.	Box 101, El Toro	p	El Toro
Riverside County			
Owens-Illinois Gen. Offices, Attn: Floyd M. Canter, Asst. Comp.	P.O. Box 1035-1036, Toledo 1, Ohio	g	Corona
San Diego County			
Crystal Silica Co.	Ottawa, Illinois	g, m, b, o	Oceanside

San Luis Obispo County			
Guiton Foundry Supply, Attn: Harold E. Guiton, Jr.	P.O. Box 258, Oceano	e, m	Oceano
Ventura County			
Miller Bros. Co.	3451 Randolph St., Huntington Park	m	--

a, refractory; b, blasting; m, molding; g, glass; f, fire or furnace; e, engine; fl, filtration; p, pottery; o, oil.

Shale, Expansible

Operator	Address	Location[1]
Marin County		
The McNear Co., Attn: Clayton Rice	P.O. Box 119, San Rafael	McNear Point
San Bernardino County		
Shale-Lite Corp.	4846 Azusa Canyon Rd., Irwindale	Chino
Santa Barbara County		
The Airox Co.[2]	307 W. Eighth St., Los Angeles	Casmalia
Solano County		
Basalt Rock Co., Inc.	Eighth and River Sts., Napa	Napa Junction
Ventura County		
Ridgelite Products	650 S. Grand Ave., Suite 1414, Los Angeles	Frazier Park
Rocklite Products	1800 N. Ventura Ave., Ventura	Ventura

[1] Location of processing plant.
[2] Product is a calcined diatomaceous shale.

Silver *

Mine	Type of mine**	Operator	Address	Location
Inyo County				
Defense	l	Foreman & Foreman	Sheridan, Montana	Panamint Springs
Emley	--	Cecil Self & Geo. Aho	P.O. Box 584, Lone Pine	Keeler
Pine Creek	t	Union Carbide Nuclear Co., Div. of Union Carbide Corp.	Rm. 2115, 30 E. 42d St., New York 17, N. Y.	Bishop
Santa Rosa	l	Paul Bare	Box 538, Lone Pine	Keeler
Nevada County				
Empire-Star	g	F. P. Gliko	P.O. Box 1027, Grass Valley	Grass Valley
San Bernardino County				
Kelly	s	Frank W. Royer	Red Mountain	Red Mountain
Sierra County				
Brush Creek	g	Best Mines Co., Inc.	P.O. Box 177, Downieville	Downieville
Original 16 to 1	g	Original 16 to 1 Mine	Rm. 1611, 235 Montgomery St., San Francisco 4	Alleghany
Siskiyou County				
Siskon	g	Siskon Corp.	P.O. Box 148, Happy Camp	Happy Camp
Yuba County				
Yuba	d	Yuba Consolidated Gold Fields, Div. of Yuba Consolidated Industries	351 California St., San Francisco	Hammonton

* Principal silver producers only; does not include producers of less than 1,000 oz.
** d, Gold bucket-line dredge; g, Gold mine; l, Lead mine; s, Silver mine; t, Tungsten mine.

Slate

Operator	Address	Location
El Dorado County		
Placerville Slate Products Co.	P.O. Box 63, Placerville	Chili Bar
Mariposa County		
Agua Fria Slate Quarry	Mariposa	Agua Fria
John Kingman	Mariposa	Mount Bullion

Sodium Carbonate and Sodium Sulphate

Operator	Address	Location
Inyo County		
Pittsburgh Plate Glass Co., Columbia Southern Chemical Division (soda ash, sodium sesquicarbonate)	Bartlett	Bartlett
San Bernardino County		
American Potash & Chemical Corp. (soda ash, salt cake)	3000 W. Sixth St., Los Angeles 54	Trona
West End Chemical Division, Stauffer Chemical Co. (soda ash, salt cake and glauber's salt)	1956 Webster St., Oakland 12	Westend

Stone, Crushed and Broken

Granite

Operator	Address	Location
El Dorado County		
Harms Bros.	5261 Stockton Blvd., Sacramento	--
Fresno County		
Morgan's Dump Truck Service*	7373 E. Shaw Ave., Clovis	--
Tivy Valley Granite, Joe and Vivian DeCanio	201 O St., Sanger	--
Paul E. Woof*	2203 N. Fruit Ave., Fresno	--
Imperial County		
Henry Abeyta*	1268 El Dorado, El Centro	Brawley
Los Angeles County		
A and H Granite Co.*	1534 Broadway, Burbank	--
Laird Paving Co.	4661 E. Arrow Highway, Claremont	--
McCaslin Materials Co.*	701 W. Foothill Blvd., Arcadia	Arcadia
Owl Base Materials Co.*	500 S. Alameda St., P.O. Box 509, Compton	--
Select Base Materials, Inc.*	4166 Lankershim Blvd., North Hollywood	--
Fresno County		
Bechtel Corp.	220 Bush St., San Francisco 4	Mammoth Pool
Monterey County		
W. T. Moore, V.-P & Engr.*	Pebble Beach	Pebble Beach
E. Al Henningsen*	440 Rico, Salinas	Salinas
Orange County		
R. W. McClellan & Sons*	151 Commercial Way, Costa Mesa	Anaheim
Placer County		
Elmer R. Long Co.*	Road 56, Newcastle	--
Gene Scott*	Long Valley and Newcastle, Auburn	Auburn
Union Granite Co.	P.O. Box 819, Rocklin	Rocklin
Riverside County		
Guy F. Atkinson Co., Attn: Harry James, Engr.	P.O. Box 593, South San Francisco	--
Corona Dee Gee Co.*	Corona	Corona
Haven Granite Corp.	890 S. Arroyo Parkway, Pasadena 2	Riverside

Gilbert A. Morris Excavating Co.*	P.O. Box 194, Idyllwild	--
Riley Materials Co.*	6740 Pedley Rd., Arlington	Arlington
J. B. Stringfellow Co.	P.O. Box 6, Riverside	Riverside
San Benito County		
Granite Rock Co.	P.O. Box 151, Watsonville	Logan
San Bernardino County		
Hubbs Bros. Trucking*	21674 Deberry Grand Terrace, Colton	Colton
V. L. Keller*	12862 15th St., Chino	--
W. J. Smithson & Son	P.O. Box 28, Big Bear Lake	Big Bear Lake
San Diego County		
Acme Truck Co., Inc.	6979 Mission Gorge Rd., San Diego	Dehesa, Mission Gorge
Carlsbad Rock & Sand Co., Inc.	P.O. Box 28, Lawrence Canyon, Oceanside	Carlsbad
E. E. Cowdrey*	901 W. Vista Way, Vista	Vista
Einer Bros.*	P.O. Box 936, 310 W. Grant St., Escondido	Escondido
Escondido Materials Co., Attn: Otto Einer	333 N. Cedar St., Escondido	Escondido
Hester's Granite Pit*	Rt. 2, Box 884, Dehesa Valley, El Cajon	El Cajon
Hillside Granite Pit*	1720 Jamacha Rd., El Cajon	Nilldale
Inland Paving, Inc.*, Attn: Dale Marsh	1549 Avaoado Dr., Vista	Vista
John Knox*	P.O. Box 68, 734 Vista Way, Vista	Campo
Ted Lee*	130 Hannalei Dr., Vista	--
Patterson Trucking*	P.O. Box 76, Santee	Lakeside
Duke Westland*	1308 Independence Way, Vista	--
San Mateo County		
J. O. Archibald*	P.O. Box 968, Redwood City	--
Whipple Road Quarry Co.	2186 Edgewood Rd., Redwood City	Redwood City
Santa Cruz County		
Hansen, Silvey & Sinnott	Box 326, Felton	--
Victor W. Maddock	P.O. Box 177, Soquel	Soquel

* Decomposed granite.

Stone Crushed and Broken

Limestone and Marble

Operator	Address	Location
El Dorado County		
California Rock & Gravel Co.	1800 Hobart Bldg., 582 Market St., San Francisco	Cool
Diamond Springs Lime Co.	P.O. Box 409, Diamond Springs	Diamond Springs
El Dorado Limestone Co., Inc.	Shingle Springs	Shingle Springs
Imperial County		
Don Weaver	Jucumba	Painted Gorge
Inyo County		
Inyo Marble Products	c/o Roney Tubular Equip., 1060 Lillian Way, Hollywood	Lone Pine
Kern County		
Mineral Materials Co.	1145 Westminster Ave., Alhambra	Frazier Park
Monterey County		
Barnes Const. Co.	San Marino	Salinas
Riverside County		
Imperial Limestone Products (H. T. Lucas Mining Co.)	1534 N. Hobart Blvd., Los Angeles 27	Twentynine Palms
Snotop Rock Products	P.O. Box 804, Santa Ana	West Riverside
San Bernardino County		
California Dolomite Co., Inc.	3105 Wilshire Blvd., Los Angeles	Kramer
Industrial Roofing Rock Co.	Campo Ono, San Bernardino	--
George Metcafe	Rt. 1, Box 601, Sonora	Near Victorville
Premier Limestone Prod. Co.	433 S. Spring St., Los Angeles	Wrightwood, Cushenbury Canyon
Southwestern Port. Cement Co.	1034 Wilshire Blvd., Los Angeles 17	Victorville
Victorville Lime Rock Quarry	P.O. Box 548, Victorville	Victorville
San Luis Obispo County		
Eaton & Smith	1215 Michigan Ave., San Francisco 7	Lime Mtn.
San Mateo County		
Marks Materials, Inc.	P.O. Box 806, Belmont	Rockaway Beach
Skyline Materials, Inc.	P.O. Box 806, Belmont	Belmont

Santa Barbara County		
Missile City Rock Corp.	2185 Huntington Dr., Suite 17, San Marino	Lompoc
Santa Clara County		
Permanente Cement Co., Henry J. Kaiser	1924 Broadway, Oakland	Los Altos
Tuolumne County		
Sonora Marble Ag., Attn: Walter C. Sunborg	Rt. 1, Box 599, Sonora	Sonora

Stone Crushed and Broken

Miscellaneous Stone *

Operator	Address	Location
Alameda County		
Castro Valley Rock Co.	20450 John, Hayward	Castro Valley
Corrie Bros.	28806 Castro St., Hayward	Hayward
Hayward Rock Co., Inc.	25142 Delmar Ct., Hayward	Warm Springs
Niles Quarry Co.	P.O. Box 507-A, Niles	Niles
San Leandro Rock Co.	13575 Lake Chabot Rd., San Leandro	San Leandro
Calaveras County		
Altaville Aggregates (Peirano Quarry)	P.O. Box 266, Altaville	Altaville
Harley H. Kreth	Lancha Plana-Buena Vista Rd., Ione	Ione
Contra Costa County		
Henry J. Kaiser Co.	1924 Broadway, Oakland 12	Clayton
Mt. Diablo Rock & Aggregates Co., Attn: J. R. Hunt	4137 Nulty Dr., Concord	Clayton
Pacific Cement Aggregates, Inc.	400 Alabama St., San Francisco	Clayton
Fresno County		
Atchison, Topeka, and Santa Fe Ry.	121 E. Sixth St., Los Angeles	--
Kern County		
Desert Rock Milling Co.	974 Dale St., Pasadena 5	Randsburg
M & M Mining	P.O. Box 325, Tehachapi	--
N. W. Sweetzer	P.O. Box 445, Rosamond	Rosamond

Stone Crushed and Broken—Continued

Miscellaneous Stone *

Operator	Address	Location
Los Angeles County		
Arco Rock Mills	12402 E. Los Nietos Rd., Los Nietos	--
Connolly-Pacific Co.	1924 Water St., Long Beach 2	Catalina Island
Graham Bros., Inc.	5500 N. Peck Rd., El Monte	Catalina Island
Monterey County		
Seaside Sand & Gravel Co., Inc.	P.O. Box 513, Seaside	Seaside
Nevada County		
Frank Gliko	P.O. Box 648, Grass Valley	--
Spring Hill Mining Co.	Grass Valley	--
Plumas County		
Western Pacific Co.	526 Mission St., San Francisco	--
Riverside County		
Kenneth J. MacKenzie	P.O. Box 133, White Water	--
Minnesota Mining & Mfg. Co. Att: John G. Kruse	900 Fauquier Ave., St. Paul 6, Minnesota	Temescal Canyon
San Bernardino County		
Brubaker-Mann Co.	30984 Soap Mine Rd., R.F.D. 1, Barstow	Barstow
Desert Rock Milling Co.	974 Dale St., Pasadena 5	--
Hammermilled Crushed Rock Co.	13555 Live Oak, P.O. Box 661, Irwindale	--
Rainbow Rock Inc.	P.O. Box 306, Riverside Dr., Barstow	--
San Diego County		
V. R. Dennis Construction Co.	Hillcrest St., P.O. Box 3158, San Diego	San Diego
Kenneth H. Golden, Inc.	Rt. 1, Box 891, San Diego	San Diego
San Francisco County		
Charles L. Harney, Inc.	575 Berry St., San Francisco 7	Candlestick Point
San Luis Obispo County		
Robert Guerra	Rt. 1, Morro Bay	--
L. P. Stornetta & Sons	Rt. 2, Box 264-H, San Luis Obispo	--

San Mateo County		
John Furrier	934 El Camino, South San Francisco	Red Rock Hill
L. E. Lintt	Half Moon Bay Rd., Half Moon Bay	Pilarcitos
Santa Barbara County		
West Coast Construction Co.	1101 W. Laurel, Lompoc	--
Santa Clara County		
J. L. Billings	Old Calaveras Rd., P.O. Box 307, Milpitas	Milpitas
Calaveras Crushed Rock Co.	P.O. Box 708, San Jose	San Jose
Edenvale Rock Co.	821 N. 23d St., San Jose	San Jose
Mirassou Bros.	15630 Harwood Rd., Los Gatos	Los Gatos
Neary Rock Quarry, Inc.	11920 Stonebrook Ave., Los Altos	Los Altos
Page Mill Quarry Corp., Attn: Robt. J. Bahr	3291 Park Blvd., Palo Alto	Page Mill Road
Roggasch Bros. Quarry	P.O. Box 422, Los Gatos	Los Gatos
William A. Rose	5418 Club Dr., San Jose	--
Saratoga Gravel, Inc.	14731 Pierce Rd., Saratoga	Saratoga
Solano County		
S & L Co., Bert Smith	508 Jersey, Vallejo	--
Solano Excavators	130 E. O St., Benicia	--
Sonoma County		
Thomas A. Graham	P.O. Box 1, Occidental	Occidental
Charles Talbert	P.O. Box 92, Cotati	Cotati
Trinity County		
Northwestern Pacific R.R. Co.	San Rafael	Island Mountain
Tuolumne County		
Lone Hill, Inc.	5310 Harwood Rd., San Jose	Twain Harte
Norman Tune	Hwy 108, Twain Harte	--
Ventura County		
L. S. Hawley	5277 N. Vincent, Azusa	--

* Miscellaneous stone includes tuff, greenstone, metavolcanic rocks, quartz, chert.

Stone, Crushed and Broken

Sandstone

Operator	Address	Location
Contra Costa County		
Blake Brothers Co.	P.O. Box 1002, Richmond	Richmond
C & H Contractors	P.O. Box 1147, Richmond	--
Serra Bros.	R.F.D. 1, Box 355, Martinez	Pacheco
Kern County		
Monolith Portland Cement Co.	Box 65947, Glassell Sta., Los Angeles 65	Monolith
Mojave Rock Quarries	9452 E. Garvey Blvd., El Monte	Mojave
Marin County		
Basalt Rock Co., Inc.	Eighth and River Sts., Box 540, Napa	McNear Point
Hutchinson Co.	7360 Schmidt Lane, El Cerrito 8	Greenbrae
San Mateo County		
Pacific Cement Aggregates, Inc.	400 Alabama St., San Francisco	Brisbane
Santa Barbara County		
Guy F. Atkinson	P.O. Box 593, South San Francisco	--
Ventura County		
Guy F. Atkinson	P.O. Box 593, South San Francisco	--
Rancho Guadalasca, Attn: John S. Broome	8109 Coast Highway, Oxnard	--
J. B. Stringfellow Co.	P.O. Box 6, Riverside	--

Stone, Crushed and Broken

Volcanic Rock

Operator	Address	Location
Alameda County		
Gallagher & Burk, Inc.	344 High St., Oakland 1	Oakland
Contra Costa County		
A. J. McCosker	741 50th Ave., Oakland	--
A. C. & A. M. Goerig	220 Tunnel Rd., P.O. Box 98, Orinda	Orinda
Marin County		
Basalt Rock Co., Inc.	P.O. Box 540, Napa	Novato
Napa County		
Basalt Rock Co., Inc.	P.O. Box 540, Napa	Napa
San Diego County		
Don Weaver	P.O. Box 174, San Diego	--
San Mateo County		
Dempseys Rock & Stone Quarry	115 Chapman Rd., Redwood City	--
Solano County		
Henry J. Harris	2657 Ninth St., Berkeley	Benicia
J. M. Nelson	Rt. 1, Suisun	Cordelia
Sonoma County		
Hein Bros. Basalt Rock Co.	Box 162, Petaluma	Petaluma
Lawrence A. Jolliff	7240 Covey Rd., Forestville	Forestville
Thomsen & Hindman	1048 Castlewood Dr., Vallejo	--

Stone Dimension

Granite

Operator	Address	Type of stone	Location
Fresno County			
Superior Academy Granite Co.	P.O. Box 68, Clovis	c	Clovis
Lassen County			
Susanville Marble Granite Works, Antone Vazquez & Ralph Couso	918 Nevada St., or 325 Gilman, Susanville	b	Susanville
Madera County			
Raymond Granite Co., Attn: R. A. Warnert, Off. Mgr.	Raymond	b	Raymond
Placer County			
Union Granite Co., c/o Ruhkala Bros.	P.O. Box 819, Rocklin	a, b	Rocklin
San Diego County			
Clemens Granite Co., Attn: Raymond A. Clemens	3600 Suncrest Blvd., El Cajon	b	Suncrest
W. T. Blackwood & Sons	243 E. Fifth Ave., Escondido	a	Escondido
Escondido Quarries, Inc.	Rt. 3, Box 155, Escondido	a	Escondido
National Quarries	923 Park Hill Dr., Escondido	a, b	Vista and Suncrest
E. J. Snorey	4239 Arizona St., San Diego	--	--

a = black; b = light gray; c = dark gray.

Stone Dimension

Other

Operator	Address	Location	Rock Type	Trade Name
Amador County				
Sierra Madre Stone Co.	Volcano	Volcano	v	"Sierra Madre Stone"
El Dorado County				
Sierra Placerite Corp., Attn: A. E. Nicolazzi, Gen. Mgr.	Rt. 3, Box 252, Placerville	Placerville	v	"Sierra Placerite"
Inyo County				
Harry W. Amey	Box 77, Death Valley Junction	Death Valley	l	--
Stutterite Stone Co.	Box 84, Castaic		v	"Stutterite"
Kern County				
Desert Rock Milling Co.	974 Dale St., Pasadena 5	Randsburg	v	--
Los Angeles County				
Robert Cox	1975 Lundy Ave., Pasadena	Saugus	s	"Bouquet Stone"
H. A. Jones Desert Stone	215 W. Green St., Pasadena 1	Saugus	s	"Bouquet Stone"
Don Poteet	10947 Haddon Ave., Pacoima	Saugus	s	"Bouquet Stone"
F. Raggio	Rt. 2, Box 353	Saugus	s	"Bouquet Stone"
Palos Verdes Stone Dept. Great Lakes Carbon Corp	612 S. Flower St., Los Angeles 17	Palos Verdes	ms	"Palos Verde Stone"
Victor B. Williams	2605 Honolulu Ave., Montrose	Saugus	s	"Bouquet Stone"
Mariposa County				
Agua Fria Slate Quarry, Lee I. Rowland, Owner	Mariposa	Mariposa		"Agua Fria Slate"
Alan Haigh	Box 63, Coulterville	Coulterville	m	"Mariposite"
John Kingman	Star Route, Mariposa			
T& K Building Stone, Attn: S. S. Kuykendall	10901 Pine St., Los Alamitos	Coulterville	m	"Mariposite"
Mono County				
Featherock, Inc.	6331 Hollywood, Hollywood	Lee Vining	v	"Featherock"
Monterey County				
Barbo Friden Johnson	Rt. 2, Box 682, Carmel	Carmel Valley	ms	"Carmel Stone"
Bill Young	419 N. Third St., King City	King City	l	San Ardo

Other—Continued

Operator	Address	Location	Rock Type	Trade Name
Riverside County				
California Limestone Products	Rt. 1, Box 55, Blythe	Midland	w	"Driftwood" or "Tinklestone"
Lawrence Johnson	P.O. Box 821, Blythe	Midland	w	"Driftwood" or "Tinklestone"
Mineral Exploit. Co.	510 N. Fourth St., Blythe		l (?)	
	Box 798, Elsinore			
San Bernardino County				
Carrere Bros. Rock	Box 798, Elsinore			
Marbolite Quarry, c/o W. C. Higdon	Box 12, Ghost Town, Knotts Berry Farm			
Rimrock Mining Co.	1925 N. Tustin, Orange			
San Diego County				
Arnt Carlsen	P.O. Box 212, La Mesa	Suncrest	q	"Red Rose Quartzite"
Eric Neilsen	110 Alamo Rd., El Cajon		q (?)	
San Luis Obispo County				
Eaton & Smith	1215 Michigan St., San Francisco 7	Adelaide	l (?)	
Dan Sanford	P.O. Box 1161, Atascadero		ss (?)	
Arian Ramage	Adelaide Rd., Paso Robles			
Santa Barbara County				
G. Antolini & Sons	131 E. Gutierrez St., Santa Barbara	Tepesquet Canyon	ms	"Santa Maria Stone"
G. Arnoldi	600 Olive, Santa Barbara		ss (?)	
Decorative Stone Co.	755 Circle Dr., Santa Barbara			
T. J. Gann Rock Quarry	P.O. Box 1201, Lompoc			
Bert Signorelli	P.O. Box 904, Lompoc			
Santa Clara County				
Mirassou Bros.	15630 Harwood Rd., Los Gatos	Los Gatos	v	
Santa Cruz County				
Pacific Limestone Prods. Co.	440 Spring St., Santa Cruz	Santa Cruz	l	
Sonoma County				
Paul Cabrol	190 Seaview, San Rafael	Glen Ellen	v	"Sonoma Stone"
J. B. Wingate & Son (Trinity Quarry)	585 Trinity Rd., Glen Ellen	Glen Ellen	v	"Sonoma Stone"

Stanislaus County			
S. R. Greenup	P.O. Box 264, Jamestown		ss (?)
Tuolumne County			
Dolph Jacobs	Box 115, Tuolumne		m
Ventura County			
W. W. Vance	R.R.D. Box 129	Ojai	ss

v=volcanic rock; l=limestone; s=mica schist; ms=Monterey "shale"; m=mariposite; w=wollastonite; q=quartzite; ss=sandstone.

Sulfur Ore

Operator	Address	Location
Alpine County		
Anaconda Co.	25 Broadway, New York 4, N. Y.	Markleeville
Kern County		
Crown Uranium Co.	301 S. Lincoln Ave., Taft	Taft
Inyo County		
Inyo Soil Sulfur Co., (R. E. Kitching)	310 Pacific St., Bakersfield	Bigpine
Nikolaus and Nikolaus Co.	Bigpine	Bigpine
Lake County		
C. Park Henry	50 The Uplands, Berkeley	S-Bar S Ranch
Wolf Creek Mining Co.	Box 52, Clear Lake Highlands	Clear Lake Oaks

Talc, Soapstone, and Pyrophyllite

Mine	Type of mine*	Operator	Address	Location
El Dorado County				
Swift	b	Pacific Mineral Products Co.	337 10th St., Richmond	Shingle Springs
----	b	Industrial Minerals & Chemical Co.	836 Gilman St., Berkeley 10	Shingle Springs
Inyo County				
Hilltop	a	Bigpine Trucking Co.	Box 658, Bigpine	Bigpine
Warm Springs	a	Louise Grantham & Assoc.	1915 S. Coast Hwy., Laguna Beach	Shoshone
Death Valley	a	Multi Mines, Inc.	2552 E. Olympic Blvd., Los Angeles 23	Shoshone
Eclipse	a	Kennedy Minerals Co., Inc.	2552 E. Olympic Blvd., Los Angeles 23	Tecopa
Eureka, Frisco, Rogers, Talc City, Ubehebe	a	Sierra Talc & Clay Co.	1608 Huntington Dr., South Pasadena	Bigpine, Keeler
Green Emerald	a, c	A. J. Carothers & S. Novak	Keeler	Keeler
Holiday & Branson	a	A. W. Brostron and C. A. Stanley	Box 615, Lone Pine	Keeler
Mammoth	a	Tennessee Minerals, Inc.	5433 Reseda Blvd., Tarzana	Tecopa
Quartzhill	a	G. Hernandez	Keeler	Keeler
White Eagle	a	Huntley Industrial Minerals, Inc.	P.O. Box 305, Bishop	Bigpine
White Mountain	a	William Bonham	P.O. Box 446, Lone Pine	Keeler
Los Angeles County				
Katz	b	Dr. Leon N. Katz	9837 Foothill Blvd., San Fernando	Acton
Mono County				
Colton	a	Monte Little	Bigpine	Laws
Pacific Pyrophyllite	c	Huntley Industrial Minerals, Inc.	P.O. Box 305, Bishop	Laws
San Bernardino County				
Acme, Excelsior, Monarch, Arletta, Bennie, Calmasil, Saratoga, Superior Booth, Caliente, Ibex, Rainbow, Sheep Creek, Silver Lake and Addenda, and Yucca Grove	a	Southern California Minerals Co.	320 S. Mission Rd., Los Angeles 33	Tecopa, Shoshone
Omega	a	Sierra Talc & Clay Co.	1608 Huntington Dr., South Pasadena	Baker
Superior	a	Pomona Tile Mfg. Co.	629 N. La Brea Ave., Los Angeles 36	Baker
Victorite	c	Tri-State Minerals Co.	320 S. Mission Rd., Los Angeles 33	Shoshone
Western Talc	a	Minerals Materials Co.	1145 Westminister Ave., Alhambra	Oro Grande
		Western Talc Co.	1901 E. Slauson Ave., Los Angeles	Tecopa

San Diego County				
Four Gee	c	Howard G. Golem	Rt. 1, Box 989, Escondido	Escondido
Harborlite	c	Harborlite Corp.	P.O. Box 458, Escondido	Escondido
Harris	c	Charles W. Harris	Box 117, Rancho Santa Fe	Rancho Santa Fe
Shasta County				
Ganim	a	Shasta Talc Mining Co.		Whiskeytown

* a, Talc; b, Soapstone; c, Pyrophyllite.

Tungsten Ore

Mine	Operator	Address	Location
Inyo County			
Pine Creek	Union Carbide Nuclear Co., Div. of Union Carbide Corp.	30 E. 42d St., New York 17, N. Y., Attn. W. E. Smith	Bishop

Uranium Ore

Mine	Operator	Address	Location
Kern County			
Little Sparkler	Kern Uranium Co.	P.O. Box 163, Rio Vista	Mineral Hot Springs
Lassen County			
Cornelia C 2	Harry Baker and Sons	5350 S. Virginia St., Reno, Nevada	--

Wollastonite

Operator	Address	Location
Riverside County		
California Limestone Products Co.	Rt. 1, Box 55, Blythe	Midland
Lawrence Johnson*	P.O. Box 821, Blythe	Midland

* Wollastonite float used as ornamental stone.

Zinc *

Mine	Operator	Address	Location
Inyo County			
Santa Rosa	Paul Bare		Darwin

* Principal zinc producers only (producers of 10,000 pounds or more).

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printed in CALIFORNIA STATE PRINTING OFFICE

Publications

OF THE CALIFORNIA DIVISION OF MINES

to July 1, 1961

COVER PHOTO: THE BUCKMINSTER DRILL. Reproduced from *Mining and Scientific Press*, April 29, 1876.

PUBLICATIONS

of the

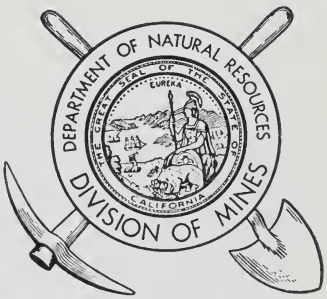
CALIFORNIA DIVISION OF MINES

To July 1, 1961

Prepared by

ELISABETH L. EGENHOFF and MARY HILL RICE

as a supplement to the
Fifty-eighth Report of the State Mineralogist



This pamphlet contains a complete list of the publications issued by the California Division of Mines * to July 1, 1961. These publications include miscellaneous maps (M), oil field maps (OM), special publications (SP), preliminary reports (PR), registers of mines (RM), reports of the State Mineralogist (R), California Journal of Mines and Geology (J), annual reports of the State Oil and Gas Supervisor (AR), special reports (SR), and Mineral Information Service (MIS). Since 1929 oil field maps and reports of the State Oil and Gas Supervisor have been issued by the California Division of Oil and Gas. Preliminary reports, registers of mines, and the California Journal of Mines and Geology have been discontinued.

Many of the books and pamphlets listed herein are out of print, and can no longer be obtained from the Division of Mines; however, persons wishing to order Division publications may obtain an up-to-date list of in-print items by requesting the latest issue of *Available Publications of the California Division of Mines*.

For the convenience of persons wishing to consult out-of-print items, a list of libraries and exchange institutions that receive Division publications has been included herein. Libraries may obtain most Division of Mines reports on temporary loan by writing to the Librarian, California State Library, Sacramento, California.

* Designated California State Mining Bureau, 1880-1927; California State Division of Mines and Mining, 1927-29.

Frontispiece. Henry G. Hanks, California's first State Mineralogist, held office from 1880 to 1886.

CONTENTS

	Page
Maps	7
Oil field maps	11
Special publications	13
Preliminary reports	17
Register of mines	19
Reports of the State Mineralogist	21
California Journal of Mines and Geology	53
Annual reports of the State Oil and Gas Supervisor	63
Bulletins	79
Special reports	107
Mineral Information Service	113
Libraries and exchange institutions receiving Division of Mines publications	131
Finding list of authors	141
Finding list of subjects	151

MISCELLANEOUS MAPS (M)

Maps listed hereunder are not part of any other publication, but were issued separately. Maps issued in connection with a bulletin, report, journal, or other publication, that were also distributed separately, will be found under the publication they accompanied. See the *Finding list of subjects*, under *Maps*.

1. Preliminary mineralogical and geological map of the State of California, showing also private land grants, scale 1″ = 21 mi., 1891.
2. Map of forest reserves in California, scale 1″ = 20 mi., 1907.
3. Relief and mineral maps of California showing the topography and the approximate locations of all the principal mineral deposits together with the statistics of mineral production, scale 1″ = 30 mi., 1908.
4. Map of Minaret district, Madera County, California, scale 1″ = 1 mi., 1908.
5. Map of Madera County, California, showing boundaries of the National Forests, scale 1″ = 3 mi., 1909.
6. Map of Placer County, California, showing boundaries of the National Forests, scale 1″ = 3 mi. (approx.), 1909.
7. Map of Shasta County, California, showing boundaries of the National Forests, scale 1″ = 3 mi., 1909.
8. Map of Sierra County, California, showing boundaries of the National Forests, scale 1″ = 1½ mi., 1909.
9. Map of Siskiyou County, California, showing boundaries of the National Forests, scale 1″ = 4 mi., 1909.
10. Map of Trinity County, California, showing boundaries of the National Forests, scale 1″ = 2 mi., 1909.
11. Map of Tuolumne County, California, showing boundaries of the National Forests, scale 1¼″ = 3 mi., 1909.
12. Map of El Dorado County, California, showing boundaries of the National Forests, scale 1″ = 2 mi., 1909.
13. Map of California showing the approximate location of the principal mineral deposits, scale 1″ = 12 mi., 1911.
14. Geological map of Inyo County, California, by C. A. Waring, scale 1″ = 4 mi., 1917.
15. Map of southern portion of California showing the saline deposits and the desert sections of the state, scale 1″ = 12 mi. (approx.), 1905.
16. Map of northern California, showing rivers and creeks which produced placer gold in 1932, scale 1″ = 20 mi. (approx.), by J. F. Bongard. Reprinted in Bulletin 135, as pl. 4.
17. Geologic map of California, scale 1″ = 8 mi., prepared under the direction of Olaf P. Jenkins, 1938. In six sheets, 32″ x 42″. Lithographed in colors.

18. Outline geologic map of California showing locations of quicksilver properties (Economic mineral map of California No. 1—quicksilver), scale 1:1,000,000, prepared under the direction of Olaf P. Jenkins, 1939.
19. Outline geologic map of California showing locations of chromite properties (Economic mineral map of California No. 3—chromite), scale 1:1,000,000, prepared under the direction of Olaf P. Jenkins, 1942.
20. Geologic map of California, Santa Maria sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Santa Maria sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.
21. Geologic map of California, Los Angeles sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Los Angeles sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.
22. Geologic map of California, Long Beach sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Long Beach sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.
23. Geologic map of California, Santa Ana sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Santa Ana sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.
24. Geologic map of California, San Luis Obispo sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, San Luis Obispo sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.
25. Geologic map of California, Bakersfield sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Bakersfield sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.
26. Geologic map of California, Trona sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Trona sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.

27. Geologic map of California, Death Valley sheet, scale 1:250,000, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert; and Explanatory chart, Death Valley sheet, geologic map of California, prepared under direction of Olaf P. Jenkins, compilation by Charles J. Kundert. Preliminary uncolored edition, 1955.

28. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), Death Valley sheet, scale 1:250,000, compilation by Charles W. Jennings; and Explanatory data, Death Valley sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings, 1st printing, 1958. 2d printing, 1961.

29. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), Alturas sheet, scale 1:250,000, compilation by Thomas E. Gay Jr. and Quintin A. Aune; and Explanatory data, Alturas sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Thomas E. Gay Jr. and Quintin A. Aune. 1958.

30. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), San Luis Obispo sheet, scale 1:250,000, compilation by Charles W. Jennings; and Explanatory data, San Luis Obispo sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings. 1958.

31. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), Santa Cruz sheet, scale 1:250,000, compilation by Charles W. Jennings and Rudolph G. Strand; and Explanatory data, Santa Cruz sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings and Rudolph G. Strand. 1958.

32. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), Santa Maria sheet, scale 1:250,000, compilation by Charles W. Jennings; and Explanatory data, Santa Maria sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings. 1959.

33. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), Ukiah sheet, scale 1:250,000, compilation by Charles W. Jennings and Rudolph G. Strand; and Explanatory data, Ukiah sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings and Rudolph G. Strand. Uncolored geologic map also distributed separately. 1960.

34. Geologic map of California, Olaf P. Jenkins edition, (lithographed in color), Westwood sheet, scale 1:250,000, compilation by Philip A. Lydon, Thomas E. Gay Jr., and Charles W. Jennings; and Explanatory data, Westwood sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Philip A. Lydon, Thomas E. Gay Jr., and Charles W. Jennings. 1960.

35. Geologic map of California, Olaf P. Jenkins edition (lithographed in color), Kingman sheet, scale 1:250,000, compilation by Charles W. Jennings; and Explanatory data, Kingman sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings. 1961.

36. Geologic map of California, Olaf P. Jenkins edition (lithographed in color), San Francisco sheet, scale 1:250,000, compilation by Charles W. Jennings and John L. Burnett; and Explanatory data, San Francisco sheet, geologic map of California, Olaf P. Jenkins edition, compiled by Charles W. Jennings. 1961.

OIL FIELD MAPS (OM)

The oil field maps in the accompanying list were revised from time to time in data, scope, and title, as development work advanced and ownership changed. Until May 1929 they were issued by the California State Mining Bureau (California State Division of Mines and Mining); since that date they have been published by the California Division of Oil and Gas.

1. Sargent, Santa Clara County.
2. Santa Maria, including Cat Canyon and Los Alamos.
3. Santa Maria, including Casmalia and Lompoc.
4. Whittier-Fullerton, including Olinda, Brea Canyon, Puente Hills, East Coyote and Richfield.
5. Whittier-Fullerton, including Whittier, West Coyote and Montebello.
6. Salt Lake, Los Angeles County.
7. Sunset and San Emidio, Kern County.
8. South Midway and Buena Vista Hills, Kern County.
9. North Midway and McKittrick, Kern County.
10. Belridge and McKittrick Front, Kern County.
11. Lost Hills and North Belridge, Kern County.
12. Devils Den, Kern County.
13. Kern River, Kern County.
14. Coalinga, Fresno County.
15. Elk Hills, Kern County.
16. Ventura-Ojai, Ventura County.
17. Santa Paula-Sespe, including Bardsdale, South Mountain and Camarillo, Ventura County.
18. Piru-Simi-Newhall, Ventura County.
19. Arroyo Grande, San Luis Obispo County.
20. Long Beach, Los Angeles County.
21. Portion of District No. 4, showing boundaries of oil fields—Kern and Kings Counties.
22. Portion of District No. 4, showing boundaries of oil fields—Kern County.
23. Portion of District No. 3, showing boundaries of oil fields—Santa Barbara County.
24. Portion of District No. 2, showing boundaries of oil fields—Ventura County.
25. Portion of District No. 1, showing boundaries of oil fields—Los Angeles and Orange Counties.
26. Huntington Beach, Orange County.
27. Santa Fe Springs, Los Angeles County.

28. Torrance, Los Angeles County.
29. Dominguez, Los Angeles County.
30. Rosecrans, Los Angeles County.
31. Inglewood, Los Angeles County.
32. Seal Beach, Los Angeles and Orange Counties.
33. Rincon, Ventura County.
34. Mt. Poso, Kern County.
35. Round Mountain, Kern County.
36. Kettleman Hills, Fresno, Kings and Kern Counties.

SPECIAL PUBLICATIONS (SP)

Publications in the following list are not a part of any established series. They are numbered here for convenience only; the numbers do not appear on the publications.

1. First annual catalogue of the State Museum of California, being the collections made by the State Mining Bureau during the year ending April 16, 1881. 1888. 220 pp. (Revised edition; only one available).
2. Contributions to the geology and mineralogy of California, by Wm. P. Blake. 1881. 15 pp.
3. Catalogue of books, maps, lithographs, photographs, etc., in the library of the State Mining Bureau at San Francisco, May 15, 1884. 19 pp.
4. Catalogue of the State Museum of California, vol. 2, being the collections made by the State Mining Bureau, from April 16, 1881 to May 15, 1884. 1884. 220 pp.
5. Catalogue of the State Museum of California, vol. 3, being the collections made by the State Mining Bureau, from May 15, 1884 to March 31, 1887. 1887. 195 pp.
6. Catalogue of the State Museum of California, vol. 4, being the collections made by the State Mining Bureau, from March 31, 1887 to August 20, 1890. 1890. 261 pp.
7. Catalogue of the library of the California State Mining Bureau, San Francisco, Cal. September 1, 1892. 149 pp.
8. Catalogue of west North American and many foreign shells with their geographical ranges, by J. G. Cooper. April 1894. 153 pp., Supplement 18 pp.
9. Catalogue of the State Museum of California, vol. 5, being the collections made by the State Mining Bureau, from September 1, 1890 to March 30, 1897. 1899. 292 pp.
10. Report of Board of Trustees for four years ending September, 1900. A. S. Cooper, State Mineralogist. 1901. 15 pp.
11. Reconnaissance of the Colorado Desert mining district, by Stephen Bowers, 1901. 19 pp., 2 illus.
12. Minerals of California and county atlas, by G. E. Bailey. 1902. 56 pp., 25 illus.
13. Report of the Board of Trustees covering the fifty-second fiscal year ending June 30, 1901, and fifty-third fiscal year ending June 30, 1902. 1902. 17 pp.

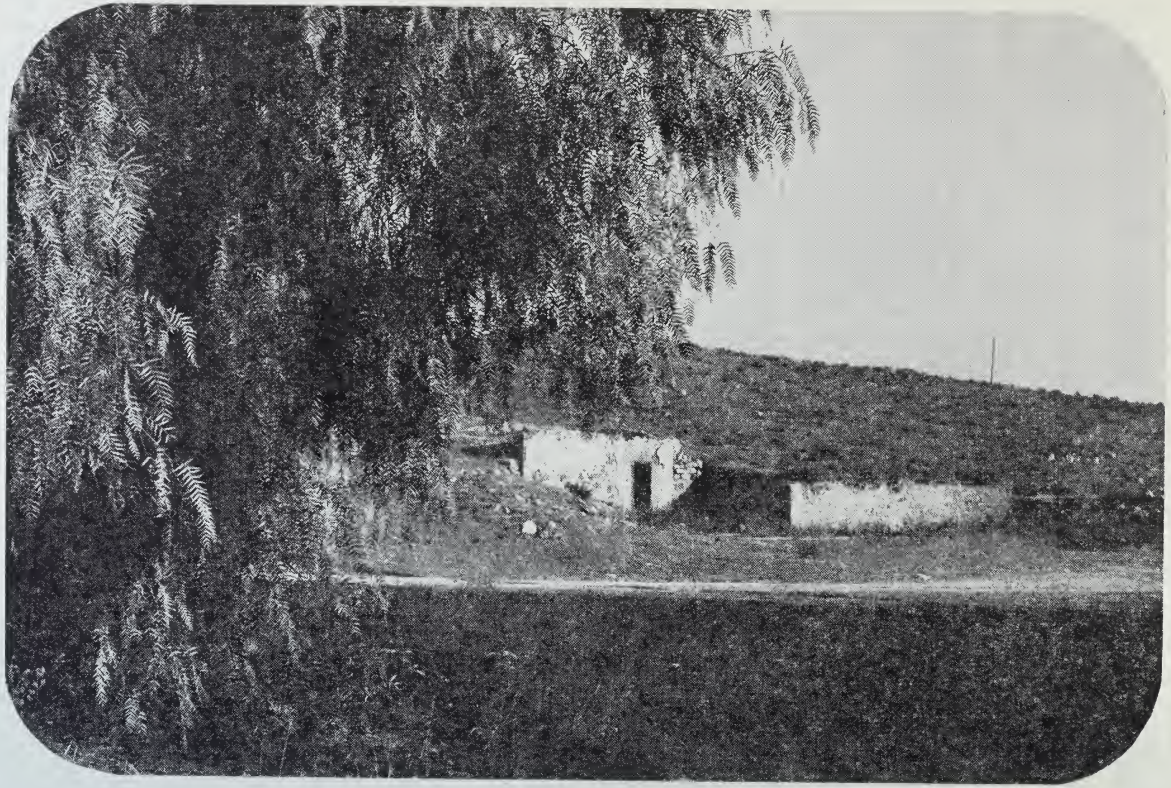
    Includes: General Appropriation Act providing for the support of the State Government for the fifty-second and fifty-third fiscal years, p. 2; Report of Board of Trustees of State Mining Bureau, pp. 3-12; Report of the State Mineralogist, by Lewis E. Aubury, pp. 13-17.

14. Report of the Board of Trustees covering the fifty-fourth fiscal year ending June 30, 1903, and fifty-fifth fiscal year ending June 30, 1904. 1904. 14 pp.
    Includes: General Appropriation Act providing for the support of the State Government for the fifty-fourth and fifty-fifth fiscal years, p. 2; Report of Board of Trustees of State Mining Bureau, pp. 3-8; Report of the State Mineralogist, by Lewis E. Aubury, pp. 9-14.
15. Report of the Board of Trustees and State Mineralogist covering the fifty-sixth fiscal year ending June 30, 1905, and fifty-seventh fiscal year ending June 30, 1906. 1906. 20 pp.
    Includes: Report of the Board of Trustees of the State Mining Bureau, pp. 3-7; Report of the State Mineralogist, by Lewis E. Aubury, pp. 8-19.
16. Report of the Board of Trustees and State Mineralogist covering the fifty-eighth fiscal year ending June 30, 1907, and fifty-ninth fiscal year ending June 30, 1908. 1908. 27 pp.
    Includes: Report of the Board of Trustees of the State Mining Bureau, pp. 3-10; Biennial report of the State Mineralogist, by Lewis E. Aubury, pp. 11-26.
17. Report of the Board of Trustees and State Mineralogist covering the sixtieth fiscal year ending June 30, 1909, and sixty-first fiscal year ending June 30, 1910. 1910. 27 pp.
    Includes: Report of the Board of Trustees of the State Mining Bureau, pp. 3-10; Biennial report of the State Mineralogist, by Lewis E. Aubury, pp. 11-27.
18. Biennial report of the State Mineralogist, Chief of the Division of Mines, for the period July 1, 1946 to June 30, 1948. 1949. 73 pp., 3 figs.
    Includes: Annual report, Division of Mines, for the ninety-eighth fiscal year, July 1, 1946 to June 30, 1947, by Olaf P. Jenkins, pp. 365-412, 3 figs.; Annual report, Division of Mines, for the ninety-ninth fiscal year, July 1, 1947 to June 30, 1948, by Olaf P. Jenkins, pp. 7-29; Public Resources Code, pp. 411-415.
19. California mineral production for 1923, with comparative 1922 data, American Mining Congress Edition. 1924. 4 pp. (Advance figures from Bulletin No. 94.)
20. Publications of the California State Division of Mines to May 1, 1949, by Elizabeth L. Egenhoff, Beth Collins, and Mary-Louise Burgess. 1949. 101 pp. 2d ed., March, 1951, 115 pp.
21. Publications of the California State Division of Mines to April 1, 1952. 1952. 119 pp.
22. Minerals of California, 1952 supplement to Bulletin 136, by Joseph Murdoch and Robert W. Webb. 1952. 46 pp.
23. Publications of the California State Division of Mines to October 1, 1952. 1952. 120 pp.
24. Publications of the California State Division of Mines to October 1, 1953. 1953. 123 pp.
25. Publications of the California State Division of Mines to July 1, 1955. 1955. 154 pp.
26. Ore buyers license act, commonly referred to as "The high grade bill." 1956. 5 pp.
27. New mining laws, reprinted from [various issues of] *Mineral Information Service.* 6 pp. 1956.

28. Field trip to the Ione clay area held in conjunction with the Sixth National Clay Conference, August 21, 1957, prepared by Fred R. Kelley and George B. Cleveland, California Division of Mines, and R. J. Arkley, University of California, Berkeley. 1957. 16 pp. (mimeographed), 2 illus.
29. Careers in economic geology in the California State Division of Mines. 1957. 4 pp., 2 illus.
30. Urbanization and the mineral industry [by Harold B. Goldman]. 1959. 4 pp., map, 5 photos.
31. Report on oil possibilities underlying state land at Ventura School for Girls. 1926. 10 pp., 3 photos, 2 figs.

    Contains: Report on oil possibilities underlying state land at Ventura School for Girls, by Lloyd L. Root, State Mineralogist, pp. 3-5, 2 photos; Geological structure and sub-surface conditions, by R. D. Bush, State Oil and Gas Supervisor, pp. 6-8, 1 photo, 2 figs. (map and cross sections); Fire hazard, by Jay W. Stevens, State Fire Marshal, pp. 9-10.
32. Two Bay area field trips—Cordilleran Section, Geological Society of America, Annual Meeting, April 28-30, 1955 (mimeographed); 2d printing, 1961 (mimeographed).

    Contains: Trip 1—Petrology: Sonoma-Petaluma area, leaders C. W. Chesterman, S. J. Rice, and Robert Rose, 4 pp., map; Trip 2—Stratigraphy: Oakland-Mt. Diablo area, leaders D. E. Savage and O. E. Bowen, 6 pp., map.



The old Cajalco tin mine at the Temescal deposit, Riverside County, which produced tin ore as early as 1891-92. *Photo by Mary Hill.*

PRELIMINARY REPORTS (PR)

1. Notes on damage by water in California oil fields. 1914. 4 pp.
   Contains: Introduction, by F. McN Hamilton, p. 1; Coalinga field, by R. P. McLaughlin, pp. 1-4.
2. Notes on damage by water in California oil fields. 1914. 4 pp.
   Contains: Introduction, by F. McN Hamilton, p. 1; Midway and Sunset fields, by R. P. McLaughlin, pp. 2-4.
3. Manganese and chromium, by E. S. Boalich. 1st ed., 1917. 32 pp., 1 illus. 2d ed., 1918. 46 pp., 2 illus.
4. Tungsten, molybdenum and vanadium, by E. S. Boalich and W. O. Castello. 1918. 44 pp.
5. Antimony, graphite, nickel, potash, strontium, tin, by E. S. Boalich and W. O. Castello. 1918. 44 pp.
6. A review of mining in California during 1919, by Fletcher Hamilton. 1920. 43 pp., 1 illus.
7. The clay industry in California, by E. S. Boalich, W. O. Castello, Emile Huguenin, C. A. Logan, W. Burling Tucker. 1920. 102 pp., 25 illus.
8. A review of mining in California during 1921, by Fletcher Hamilton. 1922. 68 pp., 1 illus.

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Pit of the old Malakoff hydraulic mine near Nevada City in Nevada County is now a scenic spot of considerable beauty. *Photo by Mary Hill.*

REGISTER OF MINES (RM)

1. Register of mines and minerals, County of Calaveras, California, by M. B. Kerr. 1900. 27 pp., 1 map.
   Contains: Map of Calaveras County, scale 1″ = 2 mi., by H. W. H. Penniman.

2. Register of mines and minerals, County of Plumas, California, by J. A. Edman. 1900. 21 pp., 1 map.
   Contains: Map of Plumas County, scale 1″ = 2 mi.

3. Register of mines and minerals, County of Siskiyou, California, by J. M. Davidson. 1900. 27 pp., 1 map.
   Contains: Map of Siskiyou County, scale 1″ = 4 mi. (approx.).

4. Register of mines and minerals, County of Trinity, California, by W. S. Lowden. 1900. 25 pp., 1 map.
   Contains: Map of Trinity County, scale 1″ = 2 mi.

5. Register of mines and minerals, County of Nevada, California, by Charles E. Uren. 1901. 12 pp., 1 map.
   Contains: Map of Nevada County, scale 1″ = 2 mi.

6. Register of mines and minerals, El Dorado County, California, by J. F. Armstrong. 1902. 17 pp., 2 maps.
   Contains: Map of El Dorado County, scale 1″ = 2 mi.; Economic and geological map of El Dorado County, p. 1.

7. Register of mines and minerals, Inyo County, California, by A. V. Davidson. 1902. 14 pp., 1 map.
   Contains: Map of Inyo County, scale 1″ = 5 mi.

8. Register of mines and minerals, Lake County, California, by George Madeira. 1902. 9 pp., 1 map.
   Contains: Map of Lake County, scale 1″ = 2½ mi. (approx.).

9. Register of mines and minerals, Placer County, California, by Ivan H. Parker. 1902. 13 pp., 1 map.
   Contains: Map of Placer County, scale 1″ = 3 mi.

10. Register of mines and minerals, Shasta County, California, by M. E. Dittmar. 1902. 15 pp., 1 map.
    Contains: Map of Shasta County, scale 1″ = 3 mi.

11. Register of mines and minerals, San Bernardino County, California, by G. E. Bailey. 1902. 20 pp., 3 maps.
    Contains: Map of San Bernardino County, scale 1″ = 6 mi.; Map of the mountains of the Mojave Desert, San Bernardino County, p. 3; Map of desert fissure springs, San Bernardino County, by R. P. McLaughlin, p. 4.

12. Register of mines and minerals, Amador County, California, by John B. Tregloan. 1903. 13 pp., 2 maps.
    Contains: Map of Amador County, scale 1″ = 1½ mi.; Economic geological map of the western half of Amador County, compiled from the maps of the U. S. Geological Survey, p. 2.

13. Register of oil wells, Los Angeles City, Los Angeles County, California, by Charles A. Blackmar. 1903. 13 pp., 1 map.
    Contains: Map of Los Angeles City oil fields.

14. Register of mines and minerals, San Diego County, California, by Irving A. Hubon. 1903. 11 pp., 1 map.
    Contains: Map of San Diego County, scale 1″ = 5 mi.

15. Register of mines and minerals, Sierra County, California, by George F. Taylor. 1903. 14 pp., 2 maps.
    Contains: Map of Sierra County, scale 1″ = 1½ mi.; Economic geological map of the western half of Sierra County, compiled from the maps of the U. S. Geological Survey, p. 1.

16. Register of mines and minerals, Tuolumne County, California, by R. P. McLaughlin. 1903. 16 pp., 2 maps.
    Contains: Map of Tuolumne County, scale 1″ = ½ mi. (approx.); Economic geological map of southwestern portion of Tuolumne County, compiled from the maps of the U. S. Geological Survey, p. 4.

17. Register of mines and minerals, Butte County, California, by W. E. Thorne. 1904. 12 pp., 2 maps.
    Contains: Map of Butte County, scale 1″ = 2 mi.; Map showing dredging lands adjacent to Feather River, Butte County, by O. W. Jasper, op. p. 4.

18. Register of mines and minerals, Kern County, California, by Marion Aubury. 1904. 22 pp., 5 maps.
    Contains: Map of Kern County, scale 1″ = 4 mi.; Kern River oil field, Kern County, by Paul W. Prutzman, p. 1; McKittrick oil field, Kern County, by Paul W. Prutzman, p. 2; Midway oil field, Kern County, by Paul W. Prutzman, p. 3; Sunset oil field, Kern County, by Paul W. Prutzman, p. 4.

19. Register of mines and minerals, Mariposa County, California, by E. M. Wilkinson. 1904. 16 pp., 2 maps.
    Contains: Map of Mariposa County, scale 1″ = 2½ mi.; Economic geological map of northwestern portion of Mariposa County, compiled from maps of U. S. Geological Survey.

20. Register of mines and minerals, Santa Barbara County, California, by Lew B. Harris. 1906. 9 pp., 4 maps.
    Contains: Map of Santa Barbara County, scale 1″ = 2 mi.; Summerland oil field, Santa Barbara County, p. 1; Santa Maria oil field, Santa Barbara County, by Lew B. Harris and J. A. Edman, p. 2; Los Alamos oil field, Santa Barbara County, by Lew B. Harris and J. A. Edman, p. 3.

21. Register of mines and minerals, Yuba County, California, by Lew B. Harris. 1906. 14 pp., 3 maps.
    Contains: Map of Yuba County, scale 1″ = 1½ mi.; Map showing dredging lands in the vicinity of Marysville, Yuba County, by Jason R. Meek, frontispiece; Economic geological map of Yuba County compiled from the maps of the U. S. Geological Survey, p. 2.

REPORTS OF THE STATE MINERALOGIST (R)

Beginning with volume 43, no. 1, the Reports of the State Mineralogist were superseded by the quarterly serial publication *California Journal of Mines and Geology*. With volume 55, the Report of the State Mineralogist was reinstated, and the *Journal* discontinued.

First Annual Report of the State Mineralogist, from June 1, 1880 to December 1, 1880; Henry G. Hanks, State Mineralogist, 43 pp.

Contains: Report, by Henry G. Hanks, p. 3; Report of progress—history, pp. 3-8; Minerals of the Pacific Coast, pp. 8-9; Donations to the museum and library, pp. 9-14; Report of the chemist, by Edward Booth, pp. 15-17; Statement of receipts and expenditures of the California State Mining Bureau, December 1, 1880, by Henry G. Hanks, p. 18; Account of the Mining Bureau fund, San Francisco—a memorandum, p. 18; Loan collections, pp. 19-22; Prospecting, pp. 22-25; Paper on the occurrence of electrum in California, pp. 25-26; Quicksilver, pp. 26-27; Iron, pp. 27-30; Salt, pp. 30-31; Tin, pp. 31-32, Chromic iron, p. 32; Building materials, pp. 32-36; Clay deposits of the state, pp. 36-38; Platinum, p. 38; Buhr millstone, p. 38; Low grade ores, pp. 38-39; Black sands from hydraulic and placer mines, pp. 39-41; Alkaline lakes, p. 41; Extensive metallurgical works required, pp. 41-42; Supply of coal, p. 42; Lithology, pp. 42-43; Ethnology, p. 43; State manufactures, p. 43.

Second Report of the State Mineralogist of California, from December 1, 1880 to October 1, 1882; Henry G. Hanks, State Mineralogist. 1882. 288 pp. 1 map; Appendix, 226 pp.

Contains: Report, by Henry G. Hanks, pp. 5-15; Report of the secretary, pp. 16-27; Placer, hydraulic, and drift mining, pp. 28-192 (General remarks, pp. 28-43; Hydraulic mining, pp. 44-118; Drift mining, p. 119; Treatment, properties, history of gold, pp. 119-157; general geology, pp. 157-170; Gold production of California, pp. 171-192); Iron ores and iron industries of California, pp. 193-201; Lumber and fuel, pp. 202-216; On the occurrence of salt in California and its manufacture, pp. 217-226; Mud volcanoes and Colorado Desert, pp. 227-240, 1 map; Diamonds in California, pp. 241-254; Notes on mica, pp. 255-261; Notes on roscoelite, pp. 262-264; On the occurrence of vivianite in Los Angeles County, p. 265; Diatoms and diatomaceous earths, pp. 266-270; Contribution to the ethnology and geology of the Pacific slope, by Philip Harvey, pp. 271-279; Glossary of terms in common use among the miners of California, pp. 280-288. **Appendix, papers supplementary to the Report of the State Mineralogist:** Forest trees of California, by A. Kellogg, pp. 3-116; Notes on hydraulic mining, by F. W. Robinson, pp. 117-129; Hydraulic and drift mining, by Henry De Groot, pp. 130-190; On the milling of gold quartz, by Melville Attwood, pp. 191-203; Rare minerals recently found in the state, by William P. Blake, pp. 205-223; Flour gold, by Almarin B. Paul, pp. 224-226.

Third Annual Report of the State Mineralogist for the year ending June 1, 1883; Henry G. Hanks, State Mineralogist. 1883. Part I, 26 pp. Part II, 111 pp., 1 map, 21 illus.

Contains: **Part I:** Report, by Henry G. Hanks, pp. 5-26: List of donors, pp. 6-7; Library, p. 7; Publications, pp. 7-8; Laboratory work, p. 8; Financial condition of the Mining Bureau, pp. 9-13; Consideration of the affairs of the State Mining Bureau, pp. 13-15; Pacific Coast Mining Exposition, pp. 15-16; Pacific Coast Mineral Exposition, pp. 16-17; The

Honduras exhibit, pp. 17-18; Visitors, p. 18; Death of Joseph Wasson, p. 18; Anticipated removal, p. 19; Danger of fire, p. 19; State map, p. 19; Economic considerations, pp. 20-21; Microscope slides, pp. 21-22; Post offices to which circulars were sent asking for samples of soil, pp. 22-25; List of the most important economic minerals, pp. 25-26. **Part II:** Report on the borax deposits of California and Nevada, by Henry G. Hanks, pp. 1-102, 1 map, 21 illus.; Index, pp. 103-111.

Fourth Annual Report of the State Mineralogist for the year ending May 15, 1884; Henry G. Hanks, State Mineralogist. 1884. 410 pp., 8 illus.

Contains: Report, by Henry G. Hanks, pp. 5-27; Introduction, p. 5; Museum, p. 6; Publications, pp. 5-6; Library, p. 6; Visitors, p. 6; Donations, P. 6-11; Statement of receipts and dusbursements, State Mining Bureau, p. 11; Chemical work, pp. 11-14; Pacific Coast Mineral Exposition of August 1883, pp. 15-27. California—information, general and statistical in relation to the agricultural, commercial, manufacturing, and other resources, interests, and industries of the state, pp. 28-59: Resources of California, etc., pp. 31-37; Agriculture, pp. 37-42; Viticulture—grapes, wines, and raisins, pp. 43-45; Statistical summary, by Henry De Groot, pp. 45-50; Manufacturing, mechanical, and other leading industries, pp. 50-59. Catalogue and description of the minerals of California as far as known, with special reference to those having an economic value, pp. 61-397, 6 illus.: Introduction, pp. 63-66; California minerals, pp. 67-397, 6 illus. Index, pp. 399-410.

Fifth Annual Report of the State Mineralogist, for the year ending May 15, 1885; Henry G. Hanks, State Mineralogist. 1885. 235 pp., 4 maps, 14 illus.

Contains: Report, by Henry G. Hanks, pp. 5-13; History of former World's Fairs or International Expositions, pp. 13-50, 7 illus. California, pp. 51-120: Geography, p. 51; Forests, p. 52; Scenery, p. 52; Climate, p. 53; Agricultural resources and products, pp. 53-54; History, pp. 54-58; California mineral exhibit in the government building, pp. 58-62; On hanksite, by William Earl Hidden, pp. 62-64, 2 illus.; Mineralogical notes—a large crystal of hanksite, by Edward S. Dana and Samuel L. Penfield (from American Journal of Science, Aug. 1885), pp. 65-66; Catalogue of the special California minerals shown at the Exposition), pp. 66-73; Gold, pp. 73-78; A simple working test for determining the quality of gold mechanically combined with auriferous vein matter, by Melville Attwood, pp. 78-87, 3 illus.; Catalogue of California gold mines represented in the Exposition, pp. 87-91; Silver, pp. 92-94; Quicksilver, pp. 95-96; Copper, pp. 96-98; Iron, pp. 98-101; Lead and base bullion, p. 101; Chrome ores, pp. 101-102; Hydrocarbons and mineral fuels, pp. 102-105; Borax, pp. 105-106; Manganese, p. 106; Tin, p. 106; Cement, pp. 106-107; Antimony, p. 107; Rocks and building stones, pp. 107-119; Sundries exhibited but not classified, pp. 119-120; Sundry special exhibits, p. 120. Notes of a flying trip of seventeen days through the gold mines of Georgia and other mining localities in the South, pp. 120-127; Mineral exhibits made by other states and territories in the government building, pp. 128-227, 1 illus.; Errata, p. 228; Index, pp. 229-235.

Sixth Annual Report of the State Mineralogist for the year ending June 1, 1886; Henry G. Hanks and William Irelan Jr., State Mineralogists. 1887. Part I, 145 pp., 2 maps, 3 illus. Part II, 222 pp., 36 illus.

Issued also in separate parts, as indicated below.

(a) **Part I, 145 pp., 2 maps, 3 illus., contains:** History of the State Mining Bureau, p. 5; Present condition of the State Mining Bureau, pp. 5-6; Donations, p. 6; Correspondence, pp. 6-7; Chemical work, p. 7; Library, p. 7; Visitors, p. 7; Publications, p. 7; Sacramento State collection of minerals, p. 7, State maps, pp. 7-8; Catalogue, p. 8; Origin of the name California, pp. 8-10; General condition of mining in California, pp.

10-11; Mining economics, pp. 11-12; Importance of gold and gold mining, pp. 12-14; Bimetalism, pp. 14-15; Difficulties attending manufacturing in California, pp. 15-16; Building stones and building materials in California, pp. 16-34; Table of altitudes, pp. 34-53; Water power, p. 54; Irrigation, pp. 54-55; Record of strata in artesian well, pp. 56-57; Mineral springs in California, pp. 58-76; Calistoga silver mines, pp. 76-77; Arrow mining district, San Bernardino County, pp. 77-78; Mount St. Helena, pp. 78-79, 2 illus.; San Diego County, pp. 80-90, 2 maps, 1 illus.; California minerals, pp. 91-141; Index, pp. 143-145.

(b) **Part II, 222 pp., 36 illus., contains:** Report of the Trustees of the State Mining Bureau, pp. 5-12; Report, by Wm. Irelan Jr., pp. 14-15; Amador County, pp. 15-24; Butte County, pp. 24-27, 3 illus; Calaveras County, pp. 27-42, 5 illus.; El Dorado County, pp. 42-43; Fresno County, pp. 43-44; Nevada County, pp. 44-52, 1 illus.; Sierra County, pp. 52-59; Tuolumne County, pp. 59-60; Tabular statement of mills, p. 61; Conclusion, p. 62; Bullion production of mines of California for 12 months ending January 1, 1886, p. 63; Number of incorporated companies, p. 64; U. S. Patents, p. 64; Hydraulic mines enjoined, p. 64; Wells, Fargo & Co.'s statistics, pp. 64-67; San Francisco Mint, pp. 67-68; Tables from report of Director of Mint, pp. 68-71; Table showing production of quicksilver in California for the year 1885, compiled by J. B. Randol, p. 72; Table showing production of quicksilver in California in the year 1886, compiled by J. B. Randol, p. 73; Hydromagnesite from Livermore, California, by F. Gutzkow, p. 74; Mine drainage, by Charles G. Yale, pp. 74-88, 3 illus.; Weight of quartz mills, pp. 88-90; Specifications for twenty-stamp gold mill, pp. 90-92; Concentration of gold and silver ores on the Pacific Coast, by J. M. Adams, pp. 92-116, 23 illus.; Golden Gate sulphuret concentrator, pp. 117-119, 1 illus.; Chlorination, by Wm. Irelan Jr., pp. 119-122; Mineral products of the United States, 1885, pp. 123-127; Summary of the mineral products of the U. S., cal. yrs. 1882-1885, pp. 128-131; U. S. mining laws, pp. 132-175; To find the value of gold or silver of a specimen, by C. H. Aaron, pp. 176-177; Tables taken from "Practical Hydraulics," by P. M. Randall, pp. 178-182; Chapter IV, Part II, Title III, Political code of the State of California, pp. 183-189; Routes of travel, modes of conveyance, distances, etc., from San Francisco, pp. 190-214; Index, pp. 215-222.

Seventh Annual Report of the State Mineralogist, for the year ending October 1, 1887; William Irelan Jr., State Mineralogist. 1888. 315 pp., 12 illus.

Contains: Report of Trustees of State Mining Bureau, pp. 5-8; Report, by Wm. Irelan Jr., p. 10; Origin of petroleum, pp. 10-11; Petroleum fields of California, pp. 11-16; Petroleum deposits in Venezuela, p. 16; Petroleum deposits in the Argentine Republic, pp. 16-17; Petroleum, where found, p. 17; Petroleum in Russia, pp. 17-23; Petroleum as a fuel, pp. 23-33, 3 illus.; Refining, pp. 34-37, 1 illus.; Chemistry of petroleum, pp. 37-41, 1 illus.; Locating for drilling, etc., pp. 41-47; Petroleum produced in and exported from the United States, 1864-1886 (from the Statistical Abstract of the United States, 1886), p. 48; Locating and patenting petroleum claims, pp. 49-50; Asphaltum and its uses, pp. 50-51; Laying of asphaltum on public thoroughfares, p. 51; Results of analyses of California asphaltum, pp. 51-53; Locating and patenting asphaltum claims, pp. 54-55; Natural gas in the Eastern States, pp. 55-56; Value of gas as a fuel, p. 56; Coal-land law and regulations thereunder, pp. 57-61; Petroleum, asphaltum, and natural gas in California, by W. A. Goodyear, pp. 65-114, 3 illus.; Coal in California, by W. A. Goodyear, pp. 117-178, 1 illus.; Natural gas in California, by Adolph H. Weber, pp. 181-191; Petroleum and asphaltum in northern California, by Adolph H. Weber, pp. 195-202, 3 illus.; Building stones, by A. Wendell Jackson, pp. 205-213; Precious metals product, United States of America and Mexico, report of Wells, Fargo & Co., pp. 217-219; Catalogue of California fossils, by J. G. Cooper, pp. 223-308; Index, pp. 309-315.

Eighth Annual Report of the State Mineralogist for the year ending October 1, 1888; William Irelan Jr., State Mineralogist. 1888. 948 pp., 10 pls., 1 map, 106 illus.

Contains: Report of Trustees of State Mining Bureau, pp. 7-10, 2 illus; California, pp. 12-16, 1 illus.; The Mining Bureau, pp. 16-22. Mineral resources of state, pp. 22-691: Alameda County, pp. 25-36, 4 illus.; Alpine County, pp. 36-40; Amador County, pp. 41-115, 12 illus.; Butte County, pp. 116-121; Calaveras County, pp. 121-157, 3 illus.; Colusa County, pp. 157-159; Contra Costa County, pp. 159-163; Del Norte County, pp. 163-164; El Dorado County, pp. 164-202; Fresno County, pp. 202-216; Humboldt County, pp. 216-223; Inyo County, by W. A. Goodyear, pp. 224-309, 15 illus. (including Owens Valley earthquake, pp. 288-309); Kern County, by W. A. Goodyear, pp. 309-324, 2 illus.; Lake County, pp. 324-329; Lassen County, pp. 329-332; Los Angeles County, pp. 332-335; Los Angeles County, by W. A. Goodyear, pp. 335-342; Marin County, p. 342; Mariposa County, pp. 343-349; Mendocino County, p. 349; Merced County, pp. 350-351; Modoc County, p. 352; Mono County, by H. A. Whiting, pp. 352-401, pls. 2-3, 1 illus.; Monterey County, pp. 402-411; Napa County, pp. 411-417; Nevada County, pp. 417-459, 1 illus.; Placer County, pp. 459-476; Plumas County, pp. 476-483; San Benito County, pp. 483-490; San Bernardino County, pp. 490-504; San Bernardino County, by W. A. Goodyear, pp. 504-512; San Diego County, pp. 512-516; San Diego County, by W. A. Goodyear, pp. 516-528; San Francisco County, pp. 528-529; San Luis Obispo County, pp. 529-533; San Mateo County, pp. 533-536; Santa Barbara County, pp. 536-540; Santa Clara County, pp. 540-550, 3 illus.; Santa Cruz County, pp. 550-556; Sacramento County, pp. 556-557; San Joaquin County, pp. 557-562; Shasta County, pp. 562-572; Sierra County, pp. 573-581; Siskiyou County, pp. 581-631; Solano County, pp. 631-632; Sonoma County, pp. 632-635; Stanislaus County, pp. 635-636; Sutter County, pp. 636-637; Tehama County, p. 637; Trinity County, pp. 637-643; Tulare County, by W. A. Goodyear, pp. 643-652; Tuolumne County, pp. 652-672, 1 illus.; Ventura County, pp. 676-678; Ventura County, by Stephen Bowers, pp. 679-690; Yolo County, p. 690; Yuba County, p. 691. Tabular statement of mills, arranged by counties, pp. 692-695; The milling of gold ores in California, by John Hays Hammond, pp. 696-735, 40 illus.; Drift mining in California, by Russell L. Dunn, pp. 736-770; Lithology of wall rocks, by Melville Attwood, pp. 771-784, 1 map, 9 illus.; Water wheels, by F. F. Thomas, pp. 785-803, 10 illus.; Notes on western lead smelting, by W. S. Keys, pp. 804-831, pls. 1-6, 8-9; The Russell process, pp. 832-835; Notes on the hydrometallurgy of gold, by C. H. Aaron, pp. 836-846; Notes on the hydrdometallurgy of silver, by C. H. Aaron, pp. 847-864; Natural and artificial cement, pp. 865-884, 1 illus.; Building stones, by A. Wendell Jackson, pp. 885-894; United States patents in California, pp. 895-896; Water rights, p. 897; The Alien Act, amendment of, p. 898; Imports of minerals and mineral products, pp. 898-899; Index, pp. 901-948.

Ninth Annual Report of the State Mineralogist, for the year ending December 1, 1889; William Irelan Jr., State Mineralogist. 1890. 352 pp., 8 pls., 51 illus.

Contains: Report of Trustees of State Mining Bureau, pp. 7-11; Report, by Wm. Irelan Jr., pp. 15-19; California's variety and distribution of mineral wealth, pp. 19-20; Mining barely begun in California, p. 20; Debasing the bullion, pp. 20-21; Number of men engaged in mining, pp. 21-23; The Mongolian element, p. 23; The California miner, pp. 23-24; More common minerals and metals, p. 24; Quartz mining, p. 24; Number of quartz mills, stamps, drops, duty, etc., pp. 24-25; Cost of mining and milling ore—value and percentage of sulphurets, etc., p. 25; Our argentiferous ores, pp. 25-26; Hydraulic mining, 26; Booming, 26-27; Drift operations, pp. 27-29; River-bed mining—how carried on in California, pp. 29-30; The Big Bend Tunnel, pp. 30-31; The northern tier of counties, pp. 31-32; The future of silver and its effects on California, pp. 32-35; Our gold bluffs and beaches, pp. 35-36; The dry and the seam diggings, the cement, pocket, and tailings deposits, nugget mining, crevicing, etc., pp. 36-38; Recovering

auriferous gravel from sea beaches and river beds by means of dredges, submarine armor, and other apparatus, pp. 39-39; What has been attempted in other countries, pp. 39-40; Letter to the State Mineralogist, by Harry I. Willey, pp. 40-45; Letter to the State Mineralogist, by Ross E. Browne, pp. 45-46; Santa Clara County, by A. H. Weber, pp. 48-56; San Nicolas Island, by Stephen Bowers, pp. 57-61; Refining and coining of the precious metals, by Sven Gumbinner, pp. 62-104; The auriferous gravels of California, by John Hays Hammond, pp. 105-138, pls. 1-8, 20 illus.; San Diego County, by W. A. Goodyear, pp. 139-154; Santa Cruz Island, by W. A. Goodyear, pp. 155-170, 1 illus.; Stray notes on the geology of the Channel Islands, by Lorenzo G. Yates, pp. 171-174, 2 illus.; The mollusca of the Channel Islands of California, by Lorenzo G. Yates, pp. 175-178, 2 illus.; Insular floras, by Lorenzo G. Yates, pp. 179-188, 1 illus.; Los Angeles County, by E. B. Preston, pp. 189-210, 6 illus.; Lassen County, by E. B. Preston, pp. 211-213; San Bernardino County, by James H. Crossman, pp. 214-239; Pottery, by Linna Irelan, pp. 240-261, 5 illus.; River mining, by R. L. Dunn, pp. 262-281, 9 illus.; Slate quarrying in California, pp. 282-283; The value of fossils as indications of important mineral products, by J. G. Cooper, pp. 284-286; Clays, by W. D. Johnston, pp. 287-308, 5 illus.; California cement, pp. 309-311; Meteorological, by George E. Barnes, pp. 312-322; Coal product of California, p. 323; The manufacture of glass in California, by Henry De Groot, pp. 324-329; Mineral products of the United States in 1888, pp. 330-339; Index, pp. 341-352.

Tenth Annual Report of the State Mineralogist for the year ending December 1, 1890; William Irelan Jr., State Mineralogist. 1890. 983 pp., 14 maps, 153 illus.

Contains: Report of the Trustees of State Mining Bureau, pp. 7-10; Report, by William Irelan Jr., pp. 13-22; Geology of the Mother Lode region, by Harold W. Fairbanks, pp. 23-90, 1 map, 31 figs.; Alameda County, by W. A. Goodyear, pp. 91-95; Alpine County, by Henry De Groot, pp. 96-97; Amador County, by J. A. Brown, pp. 98-123; Butte County, by J. A. Miner, pp. 124-146; Calaveras County, by J. A. Brown, pp. 147-152; Colusa County, by W. A. Goodyear, pp. 153-164; Contra Costa County, by W. A. Goodyear, p. 165; Del Norte County, by Alexander McGregor, pp. 166-168; El Dorado County, by Henry De Groot, pp. 169-182; Fresno County, by L. P. Goldstone, pp. 183-204, 1 map, 7 illus.; Humboldt County, by Alexander McGregor, pp. 205-208; Inyo County, by Henry De Groot, pp. 209-218; Kern County, by Myron Angel, pp. 219-226; Lake County, by W. A. Goodyear, pp. 227-271; Lassen County, by E. B. Preston, pp. 272-276; Los Angeles County, by E. B. Preston, pp. 277-283, 1 illus.; The Pico Cañon oil field, by Edward North, pp. 283-298, pls. 1-12, 1 map; Marin County, by W. A. Goodyear, p. 299; Mariposa County, by E. B. Preston, pp. 300-310, 1 illus.; Mendocino County, by Alexander McGregor, pp. 311-214; Mendocino County, by W. A. Goodyear, pp. 314-322; Merced County, by W. L. Watts, pp. 323-331; Modoc County, by E. B. Preston, pp. 332-335; Mono County, by Henry De Groot, pp. 336-344; Monterey County, by Myron Angel, pp. 345-348; Napa County, by W. A. Goodyear, pp. 349-363; Nevada County, by J. B. Hobson, pp. 364-398, 2 maps, 1 illus.; Orange County, by Stephen Bowers, pp. 399-409; Placer County, by J. B. Hobson, pp. 410-434, 6 maps, 6 illus.; The ancient river beds of the Forest Hill divide, by Ross E. Browne, pp. 435-465, 1 map, 16 illus.; Plumas County, by E. B. Preston, pp. 466-495, 4 illus.; Sacramento County, by W. L. Watts, pp. 496-514; San Benito County, by Myron Angel, pp. 515-517; San Bernardino County, its mountains, plains, and valleys, by Henry De Groot, pp. 518-539; San Diego County, by E. B. Preston, pp. 540-544, 1 illus.; The San Francisco ocean placer—the auriferous beach sands, by Henry De Groot, pp. 545-547; San Joaquin County, by W. L. Watts, pp. 548-566; San Luis Obispo County, by Myron Angel, pp. 567- 585, 2 illus.; San Mateo County, by W. L. Watts, pp. 586-594; Santa Barbara County, by Myron Angel, pp. 595-599; The Santa Maria River, by J. B. Hobson, pp. 600-601, pls. 1-4; The gas well at Summerland, by F. H. Wheelan, pp. 601-603; Santa Clara County, by W. L. Watts, pp. 604-619; Santa Cruz County, by W. L. Watts, pp. 620-

626, 1 illus.; Shasta County, by Alexander McGregor, pp. 627-641; Sierra County, by L. P. Goldstone, pp. 642-654, 1 map, 1 illus.; Siskiyou County, by J. B. Hobson, pp. 655-658; Solano County, by W. L. Watts, pp. 659-669, 1 illus.; Solano County, by W. A. Goodyear, pp. 669-671; Sonoma County, by W. A. Goodyear, pp. 672-679; Stanislaus County, by W. L. Watts, pp. 680-690; Sutter County, by E. B. Preston, p. 691; Tehama County, by E. B. Preston, pp. 692-694, 1 illus.; Trinity County, by Wm. P. Miller, pp. 695-727, pls. 1-8, 1 map; Tulare County, by Myron Angel, pp. 728-733; Tuolumne County, by L. P. Goldstone, pp. 734-757, 3 illus.; Ventura County, by Stephen Bowers, pp. 758-772; Report on the asphaltum mine of the Ventura Asphalt Company, by E. W. Hilgard, pp. 763-772, 2 illus.; Yolo County, by W. L. Watts, pp. 773-793; Yolo County, by W. A. Goodyear, pp. 793-794; Altitudes of various points northwest of San Francisco, p. 794; Yuba County, by E. B. Preston, pp. 795-802; Lead smelting, by F. C. von Petersdorff, pp. 803-851, 44 illus.; Mining of gold ores in California, by John Hayes Hammond, pp. 852-882; Location of mines, by R. P. Hammond Jr., pp. 883-896, 6 illus.; The introduction of producer-gas at the Marsac mill, Park City, Utah, by C. A. Stetefeldt, pp. 897-898; The Colorado Desert, by Charles Russell Orcutt, pp. 899-919; Quicksilver mines and reduction works, by J. B. Randol, pp. 920-929; Mineral lands within the railroad grant, Eagle Bird mine, Nevada County, pp. 930-937; Gold extraction by potassium cyanide, by Wm. D. Johnston, pp. 938-942; Rincon Hill well, pp. 943-945; Meteorites, by F. C. von Petersdorff, pp. 946-951; Index, pp. 953-983.

The following, included with report, were also distributed separately: Geological map of the Mother Lode region, scale 1″ = 1 mi. (re-issued 1896); Map of the Forest Hill divide, Placer County, California, scale 1″ = 2000 ft.; Geological map of the Iowa Hill mining district, Placer County, scale 2″ = 3000 ft., accompanied by cross-section plates, and longitudinal-section plates; Geological map of Trinity County, California, scale 1″ = 6 mi. (approx.).

Eleventh Report of the State Mineralogist (first biennial) two years ending September 15, 1892; William Irelan Jr., State Mineralogist. 1893. 612 pp., 4 maps, 73 illus.

Contains: Editor's report to the Board of Examiners, by Charles G. Yale, pp. 3-7; Report of Trustees of State Mining Bureau, pp. 11-15; Report, by William Irelan Jr., pp. 18-20; Hydraulic mining, p. 20; Drift mining, p. 20; River-bed mining, pp. 20-21; Vein mining, p. 21; Are the mines worked out?, p. 21; Silver mines, p. 22; Geological synopsis, pp. 22-23; Geology and mineralogy of Shasta County, by Harold W. Fairbanks, pp. 24-53, 1 map, 5 illus.; Notes on the geology and mineralogy of portions of Tehama, Colusa, Lake, and Napa Counties, by Harold W. Fairbanks, pp. 54-75, 3 illus.; Geology of San Diego County; also of portions of Orange and San Bernardino Counties, by Harold W. Fairbanks, pp. 76-120, 1 map, 8 illus.; Alameda County, by W. L. Watts, pp. 121-138; Amador County, by E. B. Preston, pp. 139-149; Butte County, by E. B. Preston, pp. 150-166, 1 map, 18 illus.; Calaveras County, by E. B. Preston, pp. 167-178; Colusa County, by W. L. Watts, pp. 179-188, 1 illus.; Contra Costa County, by W. L. Watts, pp. 189-194; Del Norte County, by W. L. Watts, pp. 195-199; El Dorado County, by E. B. Preston, pp. 200-209, 1 map, 3 illus.; Fresno County, by W. L. Watts, pp. 210-223, 5 illus.; Glenn County, by W. L. Watts, pp. 224-226; Humboldt County, by W. L. Watts, pp. 227-232, 2 illus.; Kern County, by W. L. Watts, pp. 233-238, 1 illus.; Lake County, by W. L. Watts, pp. 239-240; Lassen County, by E. B. Preston, pp. 241-242, 1 illus.; Los Angeles County, by W. H. Storms, pp. 243-248, 1 illus.; Marin County, by W. L. Watts, pp. 249-254; Mendocino County, by W. L. Watts, pp. 255-256; Merced County, by W. L. Watts, pp. 257-258; Monterey County, by E. B. Preston, pp. 259-262, 1 illus.; Nevada County, by J. B. Hobson and E. A. Wiltsee, pp. 263-318; Placer County, by W. L. Watts, pp. 319-322; Plumas County, by E. B. Preston, pp. 323-333, 1 illus.; Sacramento County, by W. L. Watts, pp. 334-336; San Bernardino County, by W. H. Storms, pp. 337-369, 11 illus.; San Benito County, by E. B. Preston, pp. 370-373; Santa Clara County, by W. L. Watts, pp. 374-375; San Diego County, by W. H.

Storms, pp. 376-393, 7 illus.; San Joaquin County, by W. L. Watts, p. 394; Shasta County, by Wm. G. Hodson, pp. 395-399; Sierra County, by E. B. Preston, pp. 400-419, 3 illus.; Siskiyou County, by R. L. Dunn, pp. 420-452; Sonoma County, by W. L. Watts, pp. 453-463; Stanislaus County, by W. L. Watts, pp. 464-468; Sutter County, by W. L. Watts, pp. 469-471; Tehama County, by W. L. Watts, pp. 472-479; Trinity County, by R. L. Dunn, pp. 480-484; Tulare County, by W. L. Watts, pp. 485-492; Tuolumne County, by E. B. Preston, pp. 493-513, 3 illus.; Yolo County, p. 514; Yuba County, by W. L. Watts, pp. 515-516; Hydraulic ejectors, by E. A. Wiltsee, pp. 517-520, 1 illus.; A dissertation upon the origin, development, and establishment of American mining law, by A. H. Ricketts, pp. 521-574, with index, pp. 608-609; Index pp. 575-612.

The following, included with report, were also distributed separately: Geological map of Shasta County, scale 1″ = 4 mi., approx.; Geological map of portions of San Diego, Orange, and San Bernardino Counties, scale 1″ = 6 mi.

Twelfth Report of the State Mineralogist (second biennial) two years ending September 15, 1894; J. J. Crawford, State Mineralogist. 1894. 541 pp., 10 pls., 4 maps, 98 illus.

Contains: Report of Trustees of State Mining Bureau, pp. 3-7; To the Trustees of the State Mining Bureau, by J. J. Crawford, pp. 8-20; Antimony, pp. 21-23; Argentiferous galena, pp. 23-26; Asphaltum and bituminous rock, pp. 26-33; Borax, pp. 34-35, 2 illus.; Chromic iron, pp. 35-38; Coal, pp. 38-65, 9 illus.; Copper, pp. 66-70; Gold, pp. 70-322 (includes Geology of a portion of Madera and Mariposa Counties, by W. H. Storms, pp. 165-176), 1 map, 27 illus.; Gypsum, pp. 323-325; Iron, pp. 325-327; Magnesite, p. 328; Manganese, pp. 329-330; Mineral springs, pp. 331-347; Natural gas, pp. 348-352; Petroleum, pp. 352-358; Quicksilver, pp. 358-372; Silver, pp. 372-378, 2 illus.; Structural materials, pp. 379-405, 7 illus.; Miscellaneous, pp. 406-411, 1 illus.; Method of determining the respective quantities of gold and quartz in quartz specimens, p. 412; Electric power transmission plants and the use of electricity in mining operations, by Thomas Haight Leggett, pp. 413-455, pls. 1-10, 18 illus.; Red Rock, Goler, and Summit mining districts, in Kern County, by Harold W. Fairbanks, pp. 456-458, 4 illus.; Auriferous conglomerate in California, by R. L. Dunn, pp. 459-471, 1 map; Preliminary report on the mineral deposits of Inyo, Mono, and Alpine Counties, by Harold W. Fairbanks, pp. 472-478, 2 illus.; Geology of a section of El Dorado County, by Harold W. Fairbanks, pp. 479-481; Ancient channel system of Calaveras County, by W. H. Storms, pp. 482-492, 2 maps, 7 illus.; Geology of northern Ventura, Santa Barbara, San Luis Obispo, Monterey, and San Benito Counties, by Harold W. Fairbanks, pp. 493-526, 18 illus.; Appendix, pp. 529-541 (including State Mining Bureau Act, pp. 529-532; Act establishing a system of mine bell signals, pp. 532-533; Act defining hydraulic mining, p. 534; Debris Commission Act, pp. 534-535; The Caminetti Law, pp. 535-541).

The following, included with report, were also distributed separately: Map of auriferous conglomerate deposit, Siskiyou County, California, scale 1″ = 1 mi. Map showing ancient channel system of Calaveras County, scale $\frac{8}{}$″ = 1 mi., approx.; and The ancient channel system between San Andreas and Mokelumne Hill, scale 1$\frac{8}{}$″ = 1 mi.

Thirteenth Report (third biennial) of the State Mineralogist for the two years ending September 15, 1896; J. J. Crawford, State Mineralogist. 1896. 726 pp., 1 map, 94 illus.

Contains: Report of Trustees of State Mining Bureau, pp. 3-9; To the Trustees of the State Mining Bureau, by J. J. Crawford, pp. 10-30 (includes Quartz and drift mining, pp. 10-14; Hydraulic mining, pp. 14-18; Product of precious metals, p. 18; Petroleum, p. 19; Tin, p. 19; Reports, pp. 19-20; Appropriations, p. 20; Bureau fund, p. 20; County resources, p. 20; Geological Survey, pp. 21-23; Hydrography, p. 23; Department of Mines, pp. 23-24; Official visits, p. 24; Bulletins, pp. 24-27; Miscellaneous

papers, pp. 27-28; California Miners' Association, pp. 28-29; Field assistants, pp. 29-30). Antimony, p. 31; Argentiferous galena, pp. 32-34; Asphalt and bituminous rock, pp. 35-45, 4 illus.; Borax, pp. 46-47; Chromic iron, pp. 48-50, 2 illus.; Coal, pp. 51-56; Copper, pp. 57-64, 1 illus.; Gold, pp. 64-503, 1 map, 29 illus.; Gypsum, pp. 503-504; Iron, p. 504; Magnesite, p. 505; Manganese, pp. 506-507; Mineral springs, pp. 508-524; Mining and irrigation ditches, artesian wells, etc., pp. 525-566, 3 illus.; Natural gas, pp. 567-569; Petroleum, pp. 570-593, 3 illus.; Quicksilver, pp. 594-604, 6 illus.; Silver, pp. 605-611; Structural materials, pp. 612-641, 7 illus.; Miscellaneous, pp. 642-646, 2 illus.; Appendix, pp. 647-726 (includes Preservation of structural timber, by John D. Isaacs, pp. 647-655, 1 illus.; Resumé of original researches, analyses, and refining methods of petroleum mainly from the southern counties of California, by Frederick Salathe, pp. 656-661; Oil as fuel in Los Angeles County, by W. L. Watts, pp. 662-664; Ore-deposits with special reference to the Mother Lode, by Harold W. Fairbanks, pp. 665-672; Electric-power transmission plants in California, by W. F. C. Hasson, pp. 673-678, 18 illus.; The sampling and measurement of ore-bodies in mine examinations, by Edmund B. Kirby, pp. 679-700, 13 illus.; Comstock ore-sampling, by John D. McGillivray, pp. 701-705; A water-power and compressed-air transmission plant for the North Star Mining Company, Grass Valley, California, by Arthur De Wint Foote, pp. 706-720, 4 illus.; The coming motive power, by Joseph W. Buell, from "Inventive Age," pp. 721-725; Congressional Act, making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes, p. 726, 36 illus.)

Fourteenth Report of the State Mineralogist (biennial period 1913-14); Fletcher Hamilton, State Mineralogist. 1916. 974 pp., 275 illus.

Issued also in separate parts, as indicated below.

(a) **Part 1,** The counties of Amador, Calaveras, and Tuolumne, by W. B. Tucker, pp. 1-172, 54 illus.

(b) **Part 2,** The counties of Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, by Walter W. Bradley, pp. 173-370, 71 illus.

(c) **Part 3,** The counties of Del Norte, Humboldt, Mendocino, by F. L. Lowell, pp. 371-425, 16 illus.

(d) **Part 4,** The counties of Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, by Walter W. Bradley, G. Chester Brown, F. L. Lowell, R. P. McLaughlin, pp. 427-634, 80 illus.

(e) **Part 5,** The counties of San Diego, Imperial, by Frederick J. H. Merrill, pp. 635-743, 32 illus.

(f) **Part 6,** The counties of Shasta, Siskiyou, Trinity, by G. Chester Brown, pp. 745-925, 22 illus.; Index, pp. 929-974.

Fifteenth Report of the State Mineralogist (biennial period 1915-16); Fletcher Hamilton, State Mineralogist. 1919. 990 pp., 15 pls., 3 maps, 398 illus.

Issued also in separate parts, as indicated below.

(a) **Part 1,** Alpine County, Inyo County, Mono County, by Arthur S. Eakle, Emile Huguenin, R. P. McLaughlin, and Clarence A. Waring, pp. 1-175, 8 pls., 110 illus.

(b) **Part 2,** The counties of Butte, Lassen, Modoc, Sutter, and Tehama, by W. B. Tucker and Clarence A. Waring, pp. 179-266, 24 illus.

(c) **Part 3,** The counties of El Dorado, Placer, Sacramento, Yuba, by W. B. Tucker and Clarence A. Waring, pp. 267-459, 1 map, 81 illus.

(d) **Part 4,** Los Angeles County, Orange County, Riverside County, by Frederick J. H. Merrill, pp. 461-589, 34 illus.

(e) **Part 5,** The counties of Monterey, San Benito, San Luis Obispo, Santa Barbara, Ventura, by Walter W. Bradley, Emile Huguenin, C. A. Logan, and Clarence A. Waring, pp. 590-769, 3 pls., 61 illus.

(f) **Part 6,** San Bernardino County, Tulare County, by H. C. Cloudman, Emile Huguenin, F. J. H. Merrill, and W. B. Tucker, pp. 771-954, 4 pls., 1 map, 79 illus.

Index, pp. 959-990.

Sixteenth Report of the State Mineralogist; Fletcher Hamilton, State Mineralogist. 1920. 270 pp., 188 pp., 144 pp.; 40 illus., 12 illus., 21 illus.

Issued also in separate parts, as indicated below.

(a) Mines and mineral resources of Nevada County, by Errol MacBoyle [December 1918] 1919, 270 pp., 40 illus.

(b) Mines and mineral resources of Plumas County, by Errol MacBoyle [December 1918] 1920, 188 pp., 12 illus.

(c) Mines and mineral resources of Sierra County, by Errol MacBoyle [December 1918] 1920, 144 pp., 21 illus.

Seventeenth Report of the State Mineralogist, 1920; Fletcher Hamilton, State Mineralogist. 1921. 562 pp., 8 pls., 62 illus.

Mining in California during 1920. Contains: Introduction, by Fletcher Hamilton, pp. 3-4. *San Francisco field division,* by E. S. Boalich, pp. 5-261, pls. 1-3, 27 illus.: Part I, Scope of industry, pp. 7-16, Part II, San Francisco district by counties, pp. 17-562—Alameda County, by E. Huguenin and W. O. Castello, pp. 17-42, pl. 1, 2 illus.; Colusa County, pp. 43-47; Contra Costa County, by E. Huguenin and W. O. Castello, pp. 48-67, 6 illus.; Fresno County, pp. 68-73, 1 illus.; Glenn County, pp. 74-75; Kings County, pp. 76-77; Lake County, pp. 78-82; Madera County, pp. 83-84; Marin County, p. 85; Mariposa County, by W. O. Castello, pp. 86-143; Mendocino County, pp. 144-148; Merced County, pp. 149-150; Mono County, pp. 151-155; Monterey County, pp. 156-157; Napa County, pp. 158-161; Sacramento County, p. 161; San Benito County, p. 162; San Francisco County, by E. Huguenin and W. O. Castello, pp. 163-165; San Joaquin County, p. 166; San Mateo County, by E. Huguenin and W. O. Castello, pp. 167-179, 4 illus.; Santa Clara County, by E. Huguenin and W. O. Castello, pp. 180-227, pls. 2-3, 13 illus.; Santa Cruz County, by E. Huguenin and W. O. Castello, pp. 228-241, 1 illus.; Solano County, pp. 242-247; Sonoma County, pp. 248-252; Stanislaus County, pp. 253-255; Sutter County, p. 256; Tulare County, pp. 257-260; Yolo County, pp. 260-261. *Los Angeles field division,* by W. B. Tucker, pp. 263-390, pls. 4-8, 20 illus.: Part I, Scope of industry, pp. 264-266, Part II, Los Angeles district, by counties, pp. 267-390—Imperial County, pp. 267-272; Inyo County, pp. 273-305, pls. 4-5, 10 illus.; Kern County, pp. 306-316, 1 illus.; Los Angeles County, pp. 317-322; Orange County, p. 323; Riverside County, pp. 324-332, 3 illus.; San Bernardino County, pp. 333-374, pls. 6-8, 5 illus.; San Diego County, pp. 375-383; San Luis Obispo County, pp. 384-386, 1 illus.; Santa Barbara County, pp. 387-389; Ventura County, p. 390. *Auburn field division,* by C. A. Logan, pp. 391-490, 15 illus.: Part I, Introductory, pp. 393-396, Part II, Auburn district, by counties, pp. 397-490—Alpine County, pp. 399-405, 3 illus.; Amador County, pp. 406-414, 4 illus.; Butte County, pp. 415-418; Calaveras County, pp. 419-424; El Dorado County, pp. 425-433, 1 illus.; Nevada County, pp. 434-440; Placer County, pp. 441-454, 1 illus.; Plumas County, pp. 455-473, 3 illus.; Sierra County, pp. 474-478; Tuolumne County, pp. 479-489, 3 illus.; Yuba County, p. 490. *Redding field division,* by C. McK Laizure, pp. 491-544: Part I, Scope of industry, pp. 493-501, Part II, Redding district, by counties, pp. 502-544—Del Norte County, pp. 502-503; Humboldt County, pp. 504-506; Lassen County, pp. 507-511; Modoc County, pp. 512-513; Shasta County, pp. 514-528; Siskiyou County, pp. 529-536; Tehama County, p. 537; Trinity County, pp. 538-544; Index, pp. 545-562.

Eighteenth Report of the State Mineralogist covering Mining in California and the activities of the State Mining Bureau during 1922; Fletcher Hamilton, State Mineralogist. 1923. 799 pp., 1 map, 72 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, January 1922, pp. 1-40.

Contains: Redding field division, pp. 5-6; Auburn field division, by C. A. Logan, pp. 6-8; San Francisco field division, by C. McK Laizure, pp. 8-9; Los Angeles field division, by M. A. Newman, pp. 9-10; Oil and gas development, by R. E. Collom, p. 10; Placer gold resources, by Charles S. Haley, pp. 11-12; Non-metallic minerals of southern California, by M. A. Newman, pp. 13-14; Notes on the West Point district, Calaveras County, by C. A. Logan, pp. 15-21; Mining location on stock-raising lands, pp. 22-23; Statement to war minerals relief claimants, by Fletcher Hamilton, pp. 24-27.

(b) Chapter 2, February 1922, pp. 42-93, 33 illus.

Contains: Shasta County, pp. 42-43; Trinity County, p. 43; by W. B. Tucker. El Dorado County, pp. 44-45; Nevada County, p. 45; Placer County, p. 45; by C. A. Logan. Contra Costa County, pp. 45-46; Napa County, p. 46; San Benito County, p. 46; San Mateo County, pp. 46-47; Tulare County, p. 47; by C. McK Laizure. Imperial County, pp. 47-48; Kern County, pp. 48-49; San Bernardino County, p. 49; San Diego County, p. 49; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 49-52; California's exhibit at the American Mining Congress Exposition, Chicago, Illinois, October 17-22, 1921, by Walter W. Bradley, pp. 54-58, 3 illus.; Genera of diatoms characteristic of marine and fresh waters, by G. Dallas Hanna and William M. Grant, pp. 59-76, 30 illus.; Change in mine assessment year, p. 77.

(c) Chapter 3, March 1922, pp. 96-204.

Contains: Shasta County, p. 96; Siskiyou County, pp. 96-97; Trinity County, p. 97; by W. B. Tucker. Calaveras County, pp. 97-99; Tuolumne County, pp. 99-101; by C. A. Logan. Fresno County, pp. 101-102; Madera County, p. 102; Merced County, p. 102; Santa Clara County, pp. 102-103; Stanislaus County, p. 103; by C. McK Laizure. Imperial County, p. 104; Kern and San Bernardino Counties, pp. 104-106; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 106-108; Notes on iron ore occurrences in California, by E. S. Boalich, pp. 110-113; Economic minerals of the Avawatz Mountains, by W. B. Tucker, pp. 114-117; Agstone and its possibilities in California, by C. McK Laizure, pp. 118-121.

(d) Chapter 4, April 1922, pp. 138-204, 3 illus.

Contains: Shasta County, pp. 138-139; Siskiyou County, p. 139; Trinity County, p. 139 by W. B. Tucker. Nevada County, pp. 139-143; Sierra County, p. 143; by C. A. Logan. Alameda County, pp. 143-144; Contra Costa County, p. 144; Mariposa County, pp. 144-145; San Benito County, pp. 145-146, 1 illus.; San Francisco County, p. 146; by C. McK Laizure. Kern County, pp. 146-148; San Bernardino County, pp. 148-149; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 150-151; Bibliography of coal in California, by E. S. Boalich, pp. 152-157; The metallurgy of platinum, by Louis Duparc (reprint) pp. 158-172, 1 illus.

(e) Chapter 5, May 1922, pp. 206-254, 1 illus.

Contains: Shasta County, pp. 206-207; Trinity County, p. 207; by W. B. Tucker. El Dorado County, pp. 208-210; Placer County, p. 211; by C. A. Logan. San Benito County, pp. 211-220, by E. S. Boalich. Kern County, pp. 220-221; Los Angeles County, p. 221; Riverside County, pp. 221-222; San Bernardino County, pp. 222-223; San Diego County, p. 223; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 224-225; Progress report on placer gold investigation, by Charles S. Haley, pp. 226-228; Memoranda on asphalt and bituminous sand deposits of California, by Lawrence Vander Leck, pp. 228-230; Non-metallic minerals of southern California [gypsum], by M. A. Newman, pp. 230-234; Mine

assessment year, by C. McK Laizure, pp. 234-236, 1 illus.; Division of Minerals and Statistics, by Walter W. Bradley, pp. 239-245.

(f) Chapter 6, June 1922, pp. 256-294, 2 illus.

Contains: Shasta County, pp. 256-257; Siskiyou County, p. 257; Trinity County, pp. 257-258; by W. B. Tucker. Butte County, pp. 258-261; Nevada County, p. 261; Placer County, pp. 261-263; by C. A. Logan. Contra Costa County, p. 263; Glenn County, pp. 263-264; by C. McK Laizure. Los Angeles and Riverside Counties, pp. 264-265; San Bernardino County, pp. 265-266; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 266-269; Gold lodes of the East Fork mining district, Trinity County, by W. B. Tucker, pp. 270-273; Proposed method of mining oil sands, by M. A. Newman, pp. 273-275; California minerals exhibited during Shrine Convention, by Walter W. Bradley, pp. 275-278; Division of Minerals and Statistics, by Walter W. Bradley, pp. 281-286.

(g) Chapter 7, July 1922, pp. 295-352, 5 illus.

Contains: Del Norte County, p. 295; Modoc County, p. 295; Shasta County, pp. 295-297; Siskiyou County, p. 297; Trinity County, pp. 297-298; by W. B. Tucker. Amador County, pp. 298-301; El Dorado County, p. 301; Placer County, pp. 301-302; by C. A. Logan. Madera County, pp. 303-307, by C. McK Laizure. Kern County, pp. 307-308; San Bernardino County, pp. 308-312; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 311-312; Silver lodes of the South Fork mining district, Shasta County, by W. B. Tucker, pp. 313-321, 2 illus.; Dry placers of southern California, by Charles S. Haley, pp. 321-324; Division of Minerals and Statistics, by Walter W. Bradley, pp. 327-344, 3 illus.

(h) Chapter 8, August 1922, pp. 353-403, 1 illus.

Contains: Modoc County, p. 353; Shasta County, pp. 353-354; Siskiyou County, pp. 354-355; Tehama County, p. 355; Trinity County, p. 355; by W. B. Tucker. Alpine County, pp. 355-363, by C. A. Logan. Mariposa County, pp. 363-366, by E. S. Boalich. Los Angeles County, pp. 366-368; San Bernardino County, pp. 368-370; by M. A. Newman. Oil field development operations, by R. E. Collum, pp. 370-372; Progress report on placer gold investigation, by Charles S. Haley, pp. 373-374; Valuation of mining and oil property, by Fletcher Hamilton, pp. 375-379; Division of Minerals and Statistics, by Walter W. Bradley, pp. 382-397, 1 illus.

(i) Chapter 9, September 1922, pp. 405-491, 6 illus.

Contains: Shasta County, pp. 405-413, 1 illus., by W. B. Tucker. Mono County, pp. 413-419; Napa County, p. 419; by E. S. Boalich. Inyo County, pp. 419-421; Imperial County, p. 421; Los Angeles County, p. 422; San Bernardino County, pp. 422-424; San Luis Obispo County, p. 424; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 425-426; Division of Minerals and Statistics, by Walter W. Bradley, pp. 429-485, 5 illus.

(j) Chapter 10, October 1922, pp. 493-593, 13 illus.

Contains: Shasta County, pp. 493-495; Siskiyou County, pp. 495-496; Tehama County, p. 496; Trinity County, pp. 496-499; by W. B. Tucker. Sierra County [Quartz mining in Alleghany district], pp. 499-519, 2 illus., by C. A. Logan. Tulare County, pp. 519-538, 7 illus., by C. McK Laizure. Inyo County, p. 539; Kern County, p. 539; San Bernardino County, pp. 539-542; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 543-544; Radioactivity in thermal gases at The Geysers, Sonoma County, California, by Walter W. Bradley, pp. 545-550, 4 illus.; Tertiary sluice robbers, by Charles S. Haley, pp. 550-553; China clay in California, Part I, by Thomas Normile, pp. 554-557; Division of Minerals and Statistics, by Walter W. Bradley, pp. 560-587.

(k) Chapter 11, November 1922, pp. 595-727, 1 map, 3 illus.

Contains: Lassen County, p. 595; Shasta County, pp. 595-600, 1 illus.; Siskiyou County, p. 600; Trinity County, pp. 600-601; by W. B. Tucker. El Dorado County, p. 602; Placer County, pp. 602-603; Plumas County, pp. 604-606; Yuba County, pp. 606-608; by C. A. Logan. Napa County,

pp. 608-610, 1 map, by C. McK Laizure. Inyo County, p. 611; San Bernardino County, pp. 611-614; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 615-617; California's mineral resources and the State Mining Bureau, by Fletcher Hamilton, pp. 618-627, 1 illus.; Division of Minerals and Statistics, by Walter W. Bradley, pp. 633-719.

(l) Chapter 12, December 1922, pp. 729-799, 4 illus.

Contains: Shasta County, pp. 729-733, 2 illus.; Siskiyou County, p. 733; Trinity County, pp. 733-736, 1 illus.; by W. B. Tucker. Metal mining in the Auburn district, 1922, pp. 736-740, by C. A. Logan. Inyo County, pp. 740-741; Los Angeles County, p. 741; San Bernardino County, pp. 742-744; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 745-747; Ore treatment at the Belmont Shawmut mine, Tuolumne County, by C. A. Logan, pp. 748-750, 1 illus.; Bibliography of limestone deposits in California, by C. McK Laizure, pp. 751-754; Index, pp. 769-799.

Nineteenth Report of the State Mineralogist covering Mining in California and the activities of the State Mining Bureau; Fletcher Hamilton, Lloyd L. Root, State Mineralogists. 1923. 258 pp., 29 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1923, pp. 1-52, i-x.

Contains: Redding field division, by W. B. Tucker, pp. 7-13. Auburn field division, by C. A. Logan, pp. 13-21. San Francisco field division, by C. McK Laizure, pp. 21-29. Los Angeles field division, by M. A. Newman, pp. 29-33; Oil field development operations, by R. E. Collom, pp. 33-37; Primary and secondary gold concentrations, by Charles S. Haley, pp. 38-40.

(b) Chapter 2, Mining in California, February 1923, pp. 53-87, i-x, 1 illus.

Contains: Redding field division, by W. B. Tucker, pp. 55-59. Mother Lode region, by C. A. Logan, pp. 59-60. Monterey County, by C. McK Laizure, p. 60. Kern County, p. 61; San Bernardino County, pp. 61-64; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 65-66; Mining location on stock-raising lands, pp. 67-68; Limestone deposits of McCloud River, Shasta County, and their possible value for cement material, by W. B. Tucker, pp. 69-71, 1 illus.; The problem of exploiting the small mine and prospect, by C. A. Logan, pp. 72-76.

(c) Chapter 3, Mining in California, March 1923, pp. 88-133, i-ix.

Contains: Shasta County, pp. 89-93; Siskiyou County, p. 93; Tehama County, p. 93; Trinity County, p. 94; by W. B. Tucker. Amador County, pp. 94-97, by C. A. Logan. Kern County, pp. 97-98; Los Angeles County, p. 98; San Bernardino County, pp. 98-100; San Diego County, p. 100; by M. A. Newman. Oil field development operations, by R. E. Collom, pp. 101-102; Notes on peat and its occurrence in California, by C. McK Laizure, pp. 103-107.

(d) Chapter 4, Mining in California, September 1923, pp. 134-244, i-ix, 28 illus.

Contains: Lassen County, p. 135; Shasta County, pp. 135-137; Siskiyou County, pp. 138-139; Trinity County, pp. 139-140; by W. B. Tucker. Nevada County, p. 140; Placer County, pp. 140-141; El Dorado County, pp. 141-143; Amador County, p. 143; Calaveras County, pp. 143-144; Tuolumne County, pp. 144-145; by C. A. Logan. Mendocino County, by C. McK Laizure, pp. 145-154, 3 illus. Imperial County, pp. 154-155; Kern County, pp. 155-164, 1 illus.; Los Angeles County, pp. 164-165; Orange County, p. 165; San Bernardino County, pp. 165-173, by W. B. Tucker. Oil field development operations, by R. E. Collom, pp. 174-184; Clay deposits of the Alberhill Coal and Clay Company, by James H. Hill, pp. 185-210, 19 illus.; Oil shale in Santa Barbara County, California, by F. D. Gore, pp. 211-224, 5 illus.; Agricultural Minerals Act, pp. 225-226. Index, pp. 247-258.

Twentieth Report of the State Mineralogist covering Mining in California and the activities of the State Mining Bureau; Lloyd L. Root, State Mineralogist. 1924. 473 pp., 45 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1924, pp. 1-72, i-ix, 10 illus.

Contains: Amador County, pp. 1-3; Calaveras County, pp. 4-7; El Dorado County, pp. 8-9; Nevada County, pp. 9-12; Placer County, pp. 13-14; Plumas County, p. 14; Shasta County, pp. 15-17; Sierra County, pp. 17-18; Tuloumne County, pp. 19-23, 1 illus., by C. A. Logan. Metal mining, San Francisco field division, pp. 23-25; Non-metallic minerals, San Francisco field division, pp. 25-26; Napa County, pp. 26-28, 1 illus.; San Benito County, p. 28, 1 illus.; Santa Clara County, pp. 29-30, 1 illus.; Tulare County, pp. 30-33, by C. McK Laizure. Imperial County, p. 33; Inyo County, p. 33; Kern County, pp. 34-42, 1 map, 5 illus.; Los Angeles County, pp. 42-43; Orange County, pp. 43-45; Riverside County, pp. 45-46; San Bernardino County, pp. 46-49; San Diego County, pp. 49-50, by W. B. Tucker. Oil field development operations, by R. D. Bush, pp. 51-57.

(b) Chapter 2, Mining in California, April 1924, pp. 73-176, i-ix, 9 illus.

Contains: Amador County, pp. 73-75; Calaveras County, pp. 76-80, 1 illus.; Mono County, p. 81; Placer County, pp. 81-82; Plumas County, pp. 82-83; Sacramento County, p. 83; Sierra County, p. 83; Yuba County, p. 84, by C. A. Logan. Contra Costa County, pp. 84-85; Lake County, p. 85; Mendocino County, pp. 86-87, 1 illus., by C. McK Laizure. Imperial County, pp. 87-91, 4 illus.; Los Angeles County, p. 91; San Bernardino County, pp. 92-97; Ventura County, pp. 97-98, by W. B. Tucker. Oil field development operations, by R. D. Bush, pp. 99-104; Oil and gas rights, by A. H. Ricketts, pp. 105-148; Note on andalusite from California, by Albert B. Peck, pp. 149-154, 1 illus.

(c) Chapter 3, Mining in California, July 1924, pp. 177-353, i-ix, 12 illus.

Contains: Amador County, pp. 177-178; Calaveras County, p. 178; El Dorado County, pp. 178-179; Nevada County, p. 179; Placer County, p. 179; Siskiyou County, pp. 179-183, by C. A. Logan. Alameda County, pp. 184-185, 1 illus., by C. McK Laizure. Inyo County, pp. 185-191, 3 illus.; Kern County, p. 191; Riverside County, pp. 191-196, 5 illus.; San Bernardino County, pp. 196-200, 3 illus., by W. B. Tucker. Oil field development operations, by R. D. Bush, pp. 201-207; Oil and gas rights, by A. H. Ricketts, pp. 208-245. Appendix: Regulations concerning oil and gas permits and leases, pp. 248-250; Oil and gas regulations, pp. 251-304; Notes on the law of mining locations and lands open to mining in California, by C. A. Logan, pp. 305-320; License required to handle mining property, by Edwin T. Keiser, pp. 321-322.

(d) Chapter 4, Mining in California, October 1924, pp. 355-473, 14 illus.

Contains: Nevada County, pp. 355-362, 1 illus.; Sierra County, pp. 362-367, by C. A. Logan. Kern County, pp. 367-368; San Bernardino County, p. 368; San Diego County, pp. 368-374, by W. B. Tucker. Oil field development operations, by R. D. Bush, pp. 375-380; Oil and gas rights, by A. H. Ricketts, pp. 381-415; Mineral exhibit at American Mining Congress convention, at Sacramento, California, by Walter W. Bradley, pp. 416-418; Copper resources of Shasta County, by W. B. Tucker, pp. 419-447, 13 illus. Index, pp. 461-473.

Twenty-first Report of the State Mineralogist covering Mining in California and the activities of the State Mining Bureau; Lloyd L. Root, State Mineralogist. 1925. 624 pp., 3 pls., 4 maps, 109 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1925, pp. 1-133, i-ix, 24 illus.

Contains: Sacramento County, by C. A. Logan, pp. 1-22, 10 illus.; Monterey County, by C. McK Laizure, pp. 23-57, 9 illus.; Orange County,

by W. B. Tucker, pp. 58-71, 5 illus.; Oil field development operations, by R. D. Bush, pp. 72-76; Mining law, by A. H. Ricketts, pp. 77-121.

(b) Chapter 2, Mining in California, April 1925, pp. 134-274, i-ix, 37 illus.

Contains: Calaveras County, by C. A. Logan, pp. 135-172, 5 illus.; Merced County, by C. McK Laizure, pp. 173-183, 4 illus.; San Joaquin County, by C. McK Laizure, pp. 184-200, 8 illus.; Stanislaus County, by C. McK Laizure, pp. 200-222, 12 illus.; Ventura County, by W. B. Tucker, pp. 223-245, 8 illus.; Oil field development operations, by R. D. Bush, pp. 246-250; California foundry sands, pp. 251-257.

(c) Chapter 3, Mining in California, July 1925, pp. 275-411, i-ix, 3 pls., 2 maps, 27 illus.

Contains: Ancient channels of the Duncan Canyon region, Placer County, by C. A. Logan, pp. 275-280, 1 map; Del Norte County, by C. McK Laizure, pp. 281-284; Humboldt County, by C. McK Laizure, pp. 295-324, pls. 1-3, 1 map, 9 illus.; San Diego County, by W. B. Tucker, pp. 325-382, 18 illus.; Oil field development operations, by R. D. Bush, pp. 383-389; Dealers in gold-silver ores and bullion must take out licenses, pp. 390-396.

(d) Chapter 4, Mining in California, October 1925, pp. 413-624, i-ix, 2 maps, 21 illus.

Contains: Siskiyou County, by C. A. Logan, pp. 413-498, 11 illus.; San Luis Obispo County, by C. McK Laizure, pp. 499-538, 2 maps, 4 illus.; Santa Barbara County, by W. B. Tucker, pp. 539-562, 6 illus.; Oil field development operations, by R. D. Bush, pp. 563-567; Directory of California foundries, pp. 568-572; Index, pp. 597-624.

Twenty-second Report of the State Mineralogist covering Mining in California and the activities of the State Mining Bureau; Lloyd L. Root, State Mineralogist. 1926. 610 pp., 5 maps, 129 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1926, pp. 1-119, i-ix, 18 illus.

Contains: Trinity County, by C. A. Logan, pp. 1-67, 10 illus.; Santa Cruz County, by C. McK Laizure, pp. 68-93, 8 illus.; Oil field development operations, by R. D. Bush, pp. 95-101; The so-called "mysterious white metal," by Frank Sanborn, pp. 102-107.

(b) Chapter 2, Mining in California, April 1926, pp. 120-312, i-ix, 4 maps, 47 illus.

Contains: Shasta County, by C. A. Logan, pp. 120-216, 3 maps, 26 illus.; San Benito County, by C. McK Laizure, pp. 217-247, 7 illus.; Imperial County, by W. B. Tucker, pp. 248-285, 1 map, 14 illus.; Oil field development operations, by R. D. Bush, pp. 286-291; The Federal Revenue Act and the mining industry, pp. 292-297.

(c) Chapter 3, Mining in California, July 1926, pp. 313-396, i-ix, 1 map, 18 illus.

Contains: Marin County, by C. McK Laizure, pp. 314-326, 5 illus.; Sonoma County, by C. McK Laizure, pp. 327-365, 1 map, 13 illus.; Oil field development operations, by R. D. Bush, pp. 366-369; Gas, gasoline, and petroleum, by A. H. Ricketts, pp. 370-372; Copper in California, by C. A. Logan, pp. 372-376.

(d) Chapter 4, Mining in California, October 1926, pp. 397-610, i-ix, 46 illus.

Contains: El Dorado County, by C. A. Logan, pp. 397-452, 5 illus.; Inyo County, by W. B. Tucker, pp. 453-530, 23 illus.; Oil field development operations, by R. D. Bush, pp. 531-537; The Minarets district, Madera County, by Walter W. Bradley, pp. 539-557, 18 illus.; Index, pp. 573-610.

Twenty-third Report of the State Mineralogist covering Mining in California and the activities of the State Mining Bureau; Lloyd L. Root, State Mineralogist. 1927. 456 pp., 1 map, 87 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1927, pp. 1-130, i-ix, 1 map, 27 illus.

Contains: Contra Costa County, by C. McK Laizure, pp. 2-31, 16 illus.; Mineral resources of Santa Catalina Island, by W. B. Tucker, pp. 32-39, 4 illus.; Oil field development operations, by R. D. Bush, pp. 40-43; Report of the Hydraulic Mining Commission upon the feasibility of the resumption of hydraulic mining in California, by Arthur Jarman, pp. 44-116, 1 map, 7 illus.

(b) Chapter 2, Mining in California, April 1927, pp. 131-234, i-ix, 24 illus.

Contains: Amador County, by C. A. Logan, pp. 131-202, 20 illus.; Solano County, by C. McK Laizure, pp. 203-213, 4 illus.; Oil field development operations, by R. D. Bush, pp. 214-220; Manganese ore producers' committee, p. 221; Bibliography of clay deposits in California, pp. 221-222.

(c) Chapter 3, Mining in California, July 1927, pp. 235-371, i-ix, 26 illus.

Contains: Placer County, by C. A. Logan, pp. 235-286, 10 illus.; Los Angeles County, by W. B. Tucker, pp. 287-345, 16 illus. (includes The utilization and metallurgy of titanium, by Will Baughman, pp. 299-313); Oil field development operations, by R. D. Bush, pp. 346-351; Ore Buyers' License Act, pp. 352-356.

(d) Chapter 4, Mining in California, October 1927, pp. 372-427, i-ix, 10 illus.

Contains: Mono County, by W. B. Tucker, pp. 374-406, 10 illus.; Oil field development operations, by R. D. Bush, pp. 407-410; Department of Natural Resources Act, pp. 411-413; Index, pp. 429-456.

Twenty-fourth Report of the State Mineralogist covering Mining in California and the activities of the Division of Mines and Mining; Lloyd L. Root, Walter W. Bradley, State Mineralogists. 1928. 405 pp., 2 maps, 59 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1928, pp. 1-70, i-ix, 4 illus.

Contains: Tuolumne County, by C. A. Logan, pp. 3-53, 4 illus.; Oil field development operations, by R. D. Bush, pp. 54-59.

(b) Chapter 2, Mining in California, April 1928, pp. 71-172, i-ix, 11 illus.

Contains: Mariposa County, by C. McK Laizure, pp. 72-153, 2 maps, 11 illus.; Oil field development operations, by R. D. Bush, pp. 154-158.

(c) Chapter 3, Mining in California, July 1928, pp. 173-260, i-ix, 6 illus.

Contains: Butte County, by C. A. Logan, pp. 173-210, 4 illus.; Tehama County, by Charles V. Averill, pp. 211-216, 2 illus.; Oil field development operations, by R. D. Bush, pp. 217-221; Quartz crystals, pp. 222-223; Notes on the law of mining locations and lands open to mining in California, by C. A. Logan, pp. 224-233; United States mining statutes, Title XXXII, Chapter 6, revised statutes, pp. 234-236; California statutes regarding location of mining claims, mill sites and assessment work, pp. 237-241.

(d) Chapter 4, Mining in California, October 1928, pp. 261-405, i-ix, 38 illus.

Contains: Plumas County, by Charles V. Averill, pp. 261-316, 24 illus.; Madera County, by C. McK Laizure, pp. 317-345, 14 illus.; Oil field development operations, by R. D. Bush, pp. 346-352; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 354-360; Index, pp. 375-405.

Twenty-fifth Report of the State Mineralogist covering Mining in California and the activities of the Division of Mines and Mining; Walter W. Bradley, State Mineralogist. 1929. 588 pp., 5 maps, 147 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1929, pp. 1-149, i-ix, 1 map, 61 illus.

Contains: Lassen County, by Charles V. Averill, pp. 2-9, 5 illus.; Modoc County, by Charles V. Averill, pp. 10-19, 7 illus.; Kern County, by W. B. Tucker, pp. 20-81, 1 map, 15 illus.; Oil field development operations, by R. D. Bush, pp. 82-87; Mammoth tusks found near Oroville, California, by G. Dallas Hanna, pp. 88-90, 2 illus.; Mineral pigment tests, pp. 91-92; American Manganese Products Association, p. 93; Some special methods and machines for recovery of gold and platinum in placer deposits, by C. McK Laizure, pp. 94-135, 32 illus.

(b) Chapter 2, Mining in California, April 1929, pp. 150-281, i-x, 3 maps, 19 illus.

Contains: Sierra County, by C. A. Logan, pp. 151-212, 3 maps; Napa County, by Charles V. Averill, pp. 213-242, 14 illus.; San Francisco County, by C. McK Laizure, pp. 242-245; San Mateo County, by Sam P. Senior Jr., pp. 245-259, 5 illus.; Oil field development operations, by R. D. Bush, pp. 260-265.

(c) Chapter 3, Mining in California, July 1929, pp. 282-416, i-x, 28 illus.

Contains: Colusa County, by C. A. Logan, pp. 284-300; Fresno County, by C. McK Laizure, pp. 301-336, 19 illus.; Lake County, by Charles V. Averill, pp. 337-365, 9 illus.; Oil field development operations, by R. D. Bush, pp. 366-371; Ore Buyers License Act, pp. 372-377; Assessment work on mining claim within withdrawn areas, by A. H. Ricketts, pp. 378-386; Surface rights of a mineral locator within the national forests, by A. H. Ricketts, pp. 387-390; "Mine" and "mineral" defined for Mining Bureau Act, p. 391; "Division of Mines" amendment, p. 392.

(d) Chapter 4, Mining in California, October 1929, pp. 417-588, 1 map, 39 illus.

Contains: Glenn County, by Charles V. Averill, pp. 418-426, 5 illus.; Alameda County, by C. McK Laizure, pp. 427-456, 13 illus.; Mendocino County, by Charles V. Averill, pp. 456-467, 3 illus.; Riverside County, by W. B. Tucker and R. J. Sampson, pp. 468-526, 1 map, 18 illus.; Oil field development operations, by R. D. Bush, pp. 527-532; Index, pp. 553-588.

Twenty-sixth Report of the State Mineralogist covering activities of the Division of Mines including the Geologic Branch; Walter W. Bradley, State Mineralogist. 1930. 535 pp., 4 maps, 101 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1930, pp. 1-88, i-ix, 25 illus.

Contains: Santa Clara County, by Herbert A. Franke, pp. 2-39, 13 illus.; Oil field development operations, by R. D. Bush, pp. 40-44; Barite in California, by Walter W. Bradley, pp. 45-57, 2 illus.; Mercury deposit in Coso Range, Inyo County, California, by Thor Warner, pp. 59-63, 4 illus.; Aerial photography and its importance to California geologists, by Leon T. Eliel, pp. 64-71, 6 illus.

(b) Chapter 2, Mining in California, April 1930, pp. 89-183, i-ix, 2 maps, 5 illus.

Contains: Nevada County, by C. A. Logan, pp. 90-137, 2 maps, 4 illus.; Geologic and economic mineral survey, by Olaf P. Jenkins, pp. 138-144;

Oil field development operations, by R. D. Bush, pp. 145-147; Mineral paint materials in California, by Henry H. Symons, pp. 148-160, 1 illus.; Assessment work on mining claim within withdrawn areas, by A. H. Ricketts, pp. 161-163.

(c) Chapter 3, Mining in California, July 1930, pp. 184-357, i-x, 2 maps, 35 illus.

Contains: Yuba County, by C. A. Logan, pp. 186-201, 5 illus.; San Bernardino County, by W. B. Tucker and R. J. Sampson, pp. 202-325, 2 maps, 25 illus.; Oil field development operations, by R. D. Bush, pp. 326-329; Progress report, by Olaf P. Jenkins, pp. 330-333, 1 map; Commercial grinding plants in California, by Henry H. Symons, pp. 334-345, 5 illus.

The following, included with report, was also distributed separately: Map of San Bernardino County showing locations of mines and mineral deposits, scale 1" =12 mi.

(d) Chapter 4, Mining in California, October 1930, pp. 358-535, i-x, 35 illus.

Contains: Butte County, by C. A. Logan, pp. 360-412, 10 illus.; Kings County, by Herbert A. Franke, pp. 413-423, 2 illus.; Tulare County, by Herbert A. Franke, pp. 423-471, 19 illus.; Geologic Branch, by Olaf P. Jenkins, pp. 472-474, 1 illus.; Preliminary report on the geology of southwestern Mono County, California, by Evans B. Mayo, pp. 475-482, 3 illus.; Oil field development operations, by R. D. Bush, pp. 483-487; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 489-494; Our decreasing gold supply, by Alden Anderson, pp. 495-497; Index, pp. 513-535.

Twenty-seventh Report of the State Mineralogist covering activities of the Division of Mines including the Geologic Branch; Walter W. Bradley, State Mineralogist. 1931. 582 pp., 8 pls., 8 maps, 130 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1931, pp. 1-127, i-ix, 3 maps, 39 illus.

Contains: Preliminary report on economic geology of the Shasta quadrangle, by Charles V. Averill, pp. 2-65, 1 map, 31 illus.; Record of progress by Federal departments, by Olaf P. Jenkins, pp. 67-73, 2 maps; Preparation of a new relief map of California, by H. A. Sedelmeyer, pp. 73-77, 2 illus.; Oil field development operations, by R. D. Bush, pp. 78-82; Beryllium and beryl, by Alice V. Petar, pp. 83-97; The new tariff and nonmetallic products, pp. 98-99; Crystalline talc, by Frank R. Wicks, pp. 100-104; Decorative effects in concrete, by Frank R. Wicks, pp. 105-111, 6 illus.

(b) Chapter 2, Mining in California, April 1931, pp. 128-244, i-x, 8 pls., 1 map, 15 illus.

Contains: The Mountain Copper Company, Ltd., cyanide treatment of gossan, by Charles V. Averill, pp. 129-138, 4 illus.; Publication of papers on the geology of California, by Olaf P. Jenkins, p. 140; Stratigraphic significance of the Kreyenhagen shale of California, by Olaf P. Jenkins, pp. 141-186, 11 illus.; Diatoms and silicoflagellates of the Kreyenhagen shale, by G. D. Hanna, pp. 187-201, pls. A-E; Foraminifera of the Kreyenhagen shale, by C. C. Church, pp. 202-213, pls. A-C; Preliminary report of the geology of Santa Cruz Island, Santa Barbara County, California, by William W. Rand, pp. 214-219, 1 map; Oil field development operations, by R. D. Bush, pp. 200-221.

(c) Chapter 3, Mining in California, July 1931, pp. 245-486, i-xviii, 3 maps, 53 illus.

Contains: Yuba County, by C. A. Logan, pp. 246-261, 5 illus.; San Bernardino County, by W. B. Tucker and R. J. Sampson, pp. 262-401, 2 maps, 32 illus.; Progress report, by Olaf P. Jenkins, pp. 402-403; Oil field development operations, by R. D. Bush, pp. 404-406; Feldspar, silica, andalusite and cyanite deposits in California, by R. J. Sampson and

W. B. Tucker, pp. 407-458, 1 map, 14 illus.; A note on a deposit of andalusite in Mono County, California; its occurrence and technical importance, by J. A. Jeffery and C. D. Woodhouse, pp. 459-464, 2 illus.; Establishment of Trinity and Klamath River fish and game district affects mining, pp. 465-466.

(d) Chapter 4, Mining in California, October 1931, pp. 487-582, 1 map, 23 illus.

Contains: Alpine County, by C. A. Logan, pp. 488-491; Progress report, by Olaf P. Jenkins, pp. 492-493; Geology of San Jacinto quadrangle south of San Gorgonio Pass, California, by Donald McCoy Fraser, pp. 494-540, 1 map, 23 illus.; Oil field development operations, by R. D. Bush, pp. 541-542; Notes on mining activity in Inyo and Mono Counties in July 1931, by W. B. Tucker, pp. 543-545; Index, pp. 563-582.

Twenty-eighth Report of the State Mineralogist covering activities of the Division of Mines including the Geologic Branch; Walter W. Bradley, State Mineralogist. 1932. 429 pp., 7 pls., 2 maps, 158 figs.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, Mining in California, January 1932, pp. 1-101, i-xi, pls. 1-3, 45 figs.

Contains: Economic mineral deposits of the San Jacinto quadrangle, by R. J. Sampson, pp. 3-11, pl. 1, 3 figs.; Contributions to the study of sediments, by Olaf P. Jenkins, pp. 12-13; Geology and physical properties of building stone from Carmel Valley, California, by E. Wayne Galliher, pp. 14-41, pl. 2, 25 figs.; Sediments of Monterey Bay, California, by E. Wayne Galliher, pp. 42-79, pl. 3, 17 figs.; Oil field development operations, by R. D. Bush, pp. 80-81; Sanbornite, a newly described mineral from California, by Walter W. Bradley, pp. 82-83; Sanbornite, a new barium disilicate mineral from Mariposa County, California, by Austin F. Rogers, p. 84; Topographic mapping program for California, by Everett N. Bryan, pp. 85-87; Tariff rate changed on feldspar, p. 87.

(b) Chapter 2, Mining in California, April 1932, pp. 102-255, i-xi, 1 map, 71 figs.

Contains: Progress report, by Olaf P. Jenkins, p. 109; Oil field development operations, by R. D. Bush, pp. 110-111; Elementary placer mining methods and gold-saving devices, by C. McK Laizure, pp. 112-204, 1 map, 65 figs.; The pan, rocker, and sluice box, by Henry H. Symons, pp. 205-213, 5 figs.; Prospecting for vein deposits, by Frank Sanborn, pp. 214-218, 1 fig.; Selected bibliography on placer mining, by Herbert A. Franke, pp. 219-224; Placers of southern California, by R. J. Sampson, pp. 245-255.

(c) Chapters 3-4, Mining in California, July-October 1932, pp. 256-429, pls. 2-5, 1 map, 42 figs.

Contains: Ventura County, by W. B. Tucker and R. J. Sampson, pp. 247-277, 6 figs.; Current notes, by Olaf P. Jenkins, p. 278; Report accompanying geologic map of northern Sierra Nevada, by Olaf P. Jenkins, pp. 279-298, 1 map, 8 figs.; Notes on occurrence and age of fossil plants found in the auriferous gravels of Sierra Nevada, by Ralph W. Chaney, pp. 299-302, 2 figs.; Glacial and associated stream deposits of the Sierra Nevada, by Eliot Blackwelder, pp. 303-310, 5 figs., pl. 2; Jurassic and Cretaceous divisions in the Knoxville-Shasta succession of California, by Frank M. Anderson, pp. 311-328, 5 figs., pl. 3; Geology of a part of the Panamint Range, California, by F. M. Murphy, pp. 329-356, 12 figs., pl. 4; Mineral resources of a part of the Panamint Range, by R. J. Sampson, pp. 357-376, 4 figs., pl. 5; Oil field development operations, by R. D. Bush, pp. 377-381; Acquiring mining claims through tax title, pp. 383-384; Biennial Report of the State Mineralogist, by Walter W. Bradley, pp. 385-394, 1 fig.; Index, pp. 411-429.

The following, included with report, was also distributed separately: Geologic map of northern Sierra Nevada showing Tertiary river channels and Mother Lode belt, scale $\frac{1}{8}$" = 1 mi. (reprinted to accompany Bulletin 135).

Twenty-ninth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1933. 411 pp., 8 pls., 103 figs.

Issued also in separate chapters, as indicated below.

(a) Chapters 1-2, California Journal of Mines and Geology, January-April 1933, pp. 1-268, i-xi, pls. 1-5, 78 figs.

Contains: Gold deposits of the Redding and Weaverville quadrangles, by Charles V. Averill, pp. 2-73, pls. 1-2, 18 figs.; Current notes, by Olaf P. Jenkins, pp. 74-75; Geologic formations of the Redding-Weaverville districts, northern California, by Norman E. A. Hinds, pp. 76-122, pl. 3, 1 fig.; Economic geology of portons of Del Norte and Siskiyou Counties, northwesternmost California, by John H. Maxson, pp. 123-160, pl. 4, 26 figs.; Applications of geology to civil engineering, by Douglas Clark, pp. 161-173; The lakes of California, by William Morris Davis, pp. 175-236, pl. 5, 29 figs.; Oil field development operations, by R. D. Bush, pp. 237-238; Discovery of piedmontite in the Sierra Nevada, by Evans B. Mayo, pp. 239-243, 3 figs.; Suspension of assessment work, p. 243; Tracing buried-river channel deposits by geomagnetic methods, by Elmer W. Ellsworth, pp. 244-250, 2 figs.

The following, included with report, was also distributed separately: Geologic map of the Redding and Weaverville quadrangles and the northwesternmost part of the Red Bluff quadrangle (gold mines located and described by Chas. V. Averill), scale 1″ = 4 mi.

(b) Chapters 3-4, California Journal of Mines and Geology, July-October 1933, pp. 268-411, pls. 6-8, 25 figs.

Contains: Gold resources of Kern County, by W. B. Tucker and R. J. Sampson, pp. 271-339, pls. 6-8, 13 figs.; Oil field development operations, by R. D. Bush, pp. 341-347; Limestone deposits of the San Francisco region, by Edwin C. Eckel, pp. 348-361, 1 map, 7 figs.; Limestone weathering and plant associations of the San Francisco region, by Junea W. Kelly, pp. 362-367, 3 figs.; Booming, by C. McK Laizure, pp. 368-371, 1 fig.; Death Valley National Monument, California, by Herbert Hoover, pp. 371-372, 1 fig.; New state legislation, pp. 373-377; Index, pp. 397-411.

Thirtieth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1934. 487 pp., 5 pls., 2 maps, 182 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1934, pp. 1-114, i-xiii, pls. 1-3, 48 illus.

Contains: Current notes, by Olaf P. Jenkins, pp. 3-4, 1 illus.; Resurrection of early surfaces in the Sierra Nevada, by Olaf P. Jenkins, pp. 5-6; Geology and mineral resources of northeastern Madera County, California, by Homer D. Erwin, pp. 7-78, pl. 1, 41 illus.; Geology and mineral deposits of Laurel and Convict basins, southwestern Mono County, California, by Evans B. Mayo, pp. 79-88, pls. 2-3, 4 illus.; Oil field development operations, by R. D. Bush, pp. 89-90; Notes on sampling as applied to gold quartz deposits, by Homer D. Erwin, pp. 91-99, 2 illus.

(b) Chapters 2-3, California Journal of Mines and Geology, April-July 1934, pp. 115-302, i-xiii, 1 map, 97 illus.

Contains: Oil field development operations, by R. D. Bush, pp. 118-119; Elementary placer mining in California and notes on the milling of gold ores, by C. McK Laizure with contributions by H. H. Symons, Frank Sanborn, and H. A. Franke, pp. 121-289, 1 map, 97 illus.

(c) Chapter 4, California Journal of Mines and Geology, October 1934, pp. 303-487, pls. 4-5, 37 illus.

Contains: Current mining developments in northern California, by Charles V. Averill, pp. 303-309; Current mining activity in southern California, by W. B. Tucker, pp. 310-327, 6 illus.; Current notes, by Olaf P. Jenkins, pp. 328-329, 1 illus.; Geology and mineral deposits of the Julian district, San Diego County, California, by Maurice Donnelly, pp. 331-370, pl. 4, 13 illus.; Geology and mineral deposits of the Elizabeth Lake quadrangle, California, by Edward C. Simpson, pp. 371-415, pl. 5, 15 illus.; Geologic features of the dry placers of the northern Mojave desert, by

Carlton D. Hulin, pp. 416-426, 2 illus.; Oil field development operations, by R. D. Bush, pp. 427-429; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 431-439; Government cannot challenge right to mining claims for failure to perform annual assessment work within withdrawn areas, pp. 440-443; Death Valley National Monument is now open to mining, pp. 444-445; Index, pp. 474-487.

The following, included with report, was also distributed separately: Geologic map of Elizabeth Lake quadrangle, scale 1″ = 2 mi.

Thirty-first Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1935. 583 pp., 7 pls., 4 maps, 142 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1935, pp. 1-110, i-xiv, pl. 1, 1 map, 42 illus.

Contains: Review of gold mining in east-central California, 1934, by C. A. Logan, pp. 1-23, 9 illus.; Current mining activities in the San Francisco district with special reference to gold, by C. McK Laizure, pp. 24-48, 1 map, 10 illus.; Geological investigation of the clays of Riverside and Orange Counties, southern California, by J. Clark Sutherland, pp. 51-87, pl. 1, 23 illus.; Oil field development operations, by R. D. Bush, pp. 88-93; Information regarding mining loans by the Reconstruction Finance Corporation, pp. 95-99.

The following, included with report, was also distributed separately: Map of Mariposa County showing principal gold mines, scale 1″ = 3 mi.

(b) Chapter 2, California Journal of Mines and Geology, April 1935, pp. 111-254, i-xiv, pls. 2-3, 43 illus.

Contains: Current notes [Preliminary legend of rock formation units used on the new geologic map of California], by Olaf P. Jenkins, pp. 112-114; A geologic section across the southern Peninsular Range of California, by William J. Miller, pp. 115-142, pl. 2, 8 illus.; New technique applicable to the study of the placers, by Olaf P. Jenkins, pp. 143-210, pl. 3, 35 illus.; Oil field development operations, by R. D. Bush, pp. 211-214; Grubstake permits, by Charles F. Johnson, pp. 215-219.

(c) Chapter 3, California Journal of Mines and Geology, July 1935, pp. 255-400, i-xiv, pls. 4-5, 1 map, 15 illus.

Contains: Mines and mineral resources of Siskiyou County, by Charles V. Averill, pp. 255-338, pl. 4, 13 illus.; Oil field development operations, by R. D. Bush, pp. 340-344; Dams for hydraulic mining debris, by Walter W. Bradley, pp. 345-367, pl. 5, 2 illus.; Leasing system as applied to metal mining, by W. O. Vanderburg, pp. 368-375; Mine financing in California, by Philip S. Matthews, pp. 376-381; New laws make radical change in mining rights, pp. 382-384.

The following, included with report, was also distributed separately: Map of western portion of Siskiyou County showing locations of principal gold mines, scale 1½″ = 5 mi.

(d) Chapter 4, California Journal of Mines and Geology, October 1935, pp. 401-583, pls. 6-7, 2 maps, 42 illus.

Contains: Mines and mineral resources of San Luis Obispo County, by Herbert A. Franke, pp. 402-461, 1 map, 16 illus.; Mineral resources of portions of Monterey and Kings County, by Herbert A. Franke, pp. 462-464; Mining activity at Soledad Mountain and Middle Buttes, Mojave mining district, Kern County, by W. B. Tucker, pp. 465-485, pls. 6-7, 11 illus.; Current notes, by Olaf P. Jenkins, p. 486; Geology of a portion of the Perris block, southern California, by Paul H. Dudley, pp. 487-506, 1 map, 10 illus.; Mineral resources of a portion of the Perris block, Riverside County, California, by R. J. Sampson, pp. 507-521, 5 illus.; Oil field development operation, by R. D. Bush, pp. 522-525; Index, pp. 556-583.

The following, included with report, was also distributed separately: Geologic map, portion of Perris block, southern California, scale 1″ = 2½ mi.

Thirty-second Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1936. 563 pp., 10 pls., 2 maps, 96 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1936, pp. 1-124, i-xiv, 10 illus.

Contains: Gold mines of Placer County, by C. A. Logan, pp. 7-96, 5 illus.; Borax Lake, California, by M. Vonsen and G. D. Hanna, pp. 99-108, 5 illus.; Oil field development operations, by R. D. Bush, pp. 109-112.

(b) Chapter 2, California Journal of Mines and Geology, April 1936, pp. 125-224, i-xiii, 1 map, 25 illus.

Contains: Oil field development operations, by R. D. Bush, pp. 128-131; Geology, mining, and processing of diatomite at Lompoc, Santa Barbara County, California, by Henry Mulryan, pp. 133-166, 1 map, 23 illus.; Essentials in developing and financing a prospect into a mine, by Charles Will Wright, pp. 167-188; The gold-bearing veins of Meadow Lake district, Nevada County, by A. L. Wisker, pp. 189-204, 2 illus.

(c) Chapter 3, California Journal of Mines and Geology, July 1936, pp. 225-404, i-xiv, pls. 1-8, 1 map, 28 illus.

Contains: Mines and mineral resources of Calaveras County, by C. A. Logan and Herbert A. Franke, pp. 226-364, pls. 1-8, 28 illus.; Current notes, by Olaf P. Jenkins, p. 366; Oil field development operations, by R. D. Bush, pp. 367-371; Placer mining in California with power shovels, by C. A. Logan, pp. 373-377; Assessment work on mining claims within withdrawn areas, pp. 378-381; Joshua Tree National Monument, pp. 382-383, 1 map; Cost of producing quicksilver at a California mine in 1931-1932, pp. 348-385; The age of mineral utilization, by John Wellington Finch, pp. 386-390.

(d) Chapter 4, California Journal of Mines and Geology, October 1936, pp. 405-563, pls. 1-2, 33 illus.

Contains: Mineral resources of Lassen County, by Charles V. Averill and Homer D. Erwin, pp. 405-444, pls. 1-2, 14 illus.; Mineral resources of Modoc County, by Charles V. Averill, pp. 445-457, 5 illus.; Current notes, by Olaf P. Jenkins, p. 458; Mechanics of the Lone Mountain landslides, San Francisco, California, by William M. Cogan, pp. 459-474, 14 illus.; Oil field development operations, by R. D. Bush, pp. 475-479; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 481-489; Properties and industrial applications of opaline silica, by John T. Thorndyke, pp. 490-494; Index, pp. 525-563.

Thirty-third Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1937. 385 pp., 4 pls., 1 map, 62 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1937, pp. 1-78, i-xiii, pl. 1, 12 illus.

Contains: Source data of the geologic map of California, January 1937, by Olaf P. Jenkins, pp. 9-37, pl. 1; The geology of quicksilver ore deposits, by C. N. Schuette, pp. 38-50, 11 illus.; Oil field development operations, by R. D. Bush, pp. 51-54; Prospecting for lode gold, by E. D. Gardner, pp. 57-66.

(b) Chapter 2, California Journal of Mines and Geology, April 1937, pp. 79-172, i-xiii, pl. 2, 23 illus.

Contains: Mineral resources of Plumas County, by Charles V. Averill, pp. 79-143, pl. 2, 13 illus.; Current notes, by Olaf P. Jenkins, pp. 145-146; Oil field development operations, by R. D. Bush, pp. 147-152; New placer mining debris law, pp. 154-155.

The following, included with report, was also distributed separately: Map of Plumas County, showing areal geology and locations of principal mines, scale 1″ = 3½ mi.

(c) Chapter 3, California Journal of Mines and Geology, July 1937, pp. 173-261, i-xiii, pl. 3, 1 map, 16 illus.

Contains: Mineral resources of Los Angeles County, by R. J. Sampson, pp. 173-213, 1 map, 8 illus.; Current notes, by Olaf P. Jenkins, p. 214,

1 illus.; Geology and mineral deposits of the western San Gabriel Mountains, Los Angeles County, by Gordon B. Oakeshott, pp. 215-249, pl. 3, 7 illus.

The following, included with report, was also distributed separately: Map of Los Angeles County, California, showing the principal mines and oil fields, scale 1" = 4 mi.

(d) Chapter 4, California Journal of Mines and Geology, October 1937, pp. 262-385, pl. 5, 21 illus.

Contains: Mineral resources of the Resting Springs region, Inyo County, by R. J. Sampson, pp. 264-270, pl. 5, 2 illus.; Current notes, by Olaf P. Jenkins, pp. 270-272; Paleozoic section in the Nopah and Resting Springs Mountains, Inyo County, California, by John C. Hazzard, pp. 273-339, 19 illus.; Native arsenic from Grass Valley, California, by W. D. Johnston, Jr., p. 340; Index, pp. 369-385.

Thirty-fourth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1938. 669 pp., 7 pls., 115 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1938, pp. 1-94, i-xiv, 13 illus.

Contains: Mineral development and mining activity in southern California during the year 1937, by W. B. Tucker, pp. 8-19; Doing something about earthquakes, by R. R. Lukens, pp. 21-26, 6 illus.; Gold and petroleum in California, by Waldemar Lindgren, pp. 27-32; Gem minerals of California, by Francis J. Sperisen, pp. 34-78, 7 illus.

(b) Chapter 2, California Journal of Mines and Geology, April 1938, pp. 95-204, i-xv, pl. 1, 32 illus.

Contains: Gold dredging in Shasta, Siskiyou and Trinity Counties, by Charles V. Averill, pp. 96-126, 16 illus.; Current notes, by Olaf P. Jenkins, pp. 127-129, 1 illus.; Geology of the central Santa Monica mountains, Los Angeles County, by E. K. Soper, pp. 131-180, pl. 1, 15 illus.; Marketing mica, by Paul M. Tyler, pp. 182-187.

The following is included with report: Geologic map of Los Flores and Dry Canyon quadrangles and western part of Topanga Canyon quadrangle, Santa Monica Mountains, California, scale 2" = 1⅜ mi.

(c) Chapter 3, California Journal of Mines and Geology, July 1938, pp. 205-366, i-xiv, pl. 2, 36 illus.

Contains: Mineral resources of El Dorado County, by C. A. Logan, pp. 206-280, pl. 2, 18 illus.; Current notes, by Olaf P. Jenkins, pp. 281-282; Strategic minerals in California, by Charles White Merrill, pp. 283-291; Mineral highlights of California, by Walter W. Bradley, pp. 292-297; Submarine canyons off the California coast, by Francis P. Shepard, pp. 298-310, 9 illus.; The Mountain Copper Company, Ltd., cyanide treatment of gossan, by Charles V. Averill, pp. 312-330, 9 illus.; Use of ultraviolet lights in prospecting for scheelite, by Ott F. Heizer, pp. 331-333; New State Lands Act of 1938, pp. 334-347; New amendment to the "Caminetti Act," 1938, p. 348; Addenda—supplemental data on El Dorado County Mines, pp. 363-365.

The following, included with report, was also distributed separately: Map of western portion of El Dorado County, showing mining claims, scale 1" = 2 mi.

(d) Chapter 4, California Journal of Mines and Geology, October 1938, pp. 367-669, pls. 3-7, 34 illus.

Contains: Mineral resources of Inyo County, by W. B. Tucker and R. J. Sampson, pp. 368-500, pls. 3-4, 33 illus.; Geology and ore deposits of the Darwin silver-lead mining district, Inyo County, California, by Vincent C. Kelley, pp. 503-562, pls. 5-7, 31 illus.; Sulphur deposits of Inyo County, California, by Edward D. Lynton, pp. 563-590, 14 illus.; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 592-597, 1 illus.; Index, pp. 633-669.

The following, included with report, was also distributed separately: Map of Inyo County, California, showing location of principal mines, scale 2½" = 15 mi.

Thirty-fifth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1939. 552 pp., 4 pls., 86 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1939, pp. 1-106, i-xv, pl. 1, 15 illus.

Contains: Mineral resources of San Diego County, by W. B. Tucker and Charles H. Reed, pp. 8-55, pl. 1, 7 illus.; Geology and oil possibilities of southwestern San Diego County, by Leo George Hertlein and U. S. Grant IV, pp. 57-78, 8 illus.; The prospect for "minor metals" and nonmetallic minerals, by John Wellington Finch, pp. 80-88; The right to mine, by Robert M. Searls, pp. 89-95.

The following, included with report, was also distributed separately: Map of San Diego County showing location of principal mineral deposits, scale 1" = 3 mi.

(b) Chapter 2, California Journal of Mines and Geology, April 1939, pp. 107-214, i-xiv, pl. 2, 19 illus.

Contains: Mineral resources of Shasta County, by Charles V. Averill, pp. 108-191, pl. 2, 19 illus.; The public's interest in mine taxation, by A. G. Mackenzie, pp. 194-198.

The following, included with report, was also distributed separately: Map of Shasta County showing locations of principal mineral deposits, scale 1" = 3 mi.

(c) Chapter 3, California Journal of Mines and Geology, July 1939, pp. 215-348, i-xvi, pls. 3-4, 26 illus.

Contains: Tertiary formations of northern Sacramento Valley, California, by Charles A. Anderson and R. Dana Russell, pp. 219-253, pl. 3, 14 illus.; Geology and oil possibilities of Caliente Range, Cuyama Valley, and Carrizo Plain, California, by J. E. Eaton, pp. 255-274, pl. 4, 5 illus.; Bibliography of the geology and mineral resources of California for the year 1937, prepared under the direction of Solon Shedd, with introduction by Olaf P. Jenkins, pp. 275-307; The Giant Goose Lake meteorite from Modoc County, California, by Earle G. Linsley, pp. 308-312, 3 illus.; Costs of trucking and packing ore in western gold-mining districts, by E. D. Gardner, pp. 314-330, 4 illus.; Strategic Minerals Act, pp. 331-333; Assessment work on mining claims for 1938-1939, p. 334; New mining legislation, 1939, pp. 335-337.

(d) Chapter 4, California Journal of Mines and Geology, October 1939, pp. 349-552, 26 illus.

Contains: Current notes, by Olaf P. Jenkins, pp. 350-351; Quicksilver resources of California, by Alfred L. Ransome and John L. Kellogg, pp. 353-486, 26 illus.; Sulphate minerals at the Leviathan sulphur mine, Alpine County, California, by George L. Gary, pp. 488-489; Index, pp. 523-552.

The following, was reprinted and distributed separately: Quicksilver resources of California, by Alfred L. Ransome and John L. Kellogg, pp. 353-486, 26 illus.

Thirty-sixth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1940. 494 pp., 5 pls., 127 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1940, pp. 1-114, i-xvi, 20 illus.

Contains: Current mining activity in southern California, by W. B. Tucker and R. J. Sampson, pp. 9-82, 20 illus.; Notes on beryl with a qualitative analysis for beryllium, by George L. Gary, pp. 86-95; Strategic minerals investigation procedure followed by the U. S. Bureau of Mines, by John W. Finch, pp. 96-100.

(b) Chapter 2, California Journal of Mines and Geology, April 1940, pp. 115-230, i-xvi, pl. 1, 43 illus.

Contains: Mineral resources of Mono County, by R. J. Sampson and W. B. Tucker, pp. 117-156, pl. 1, 11 illus.; General geology and ores of the Blind Spring Hill mining district, Mono County, California, by Al-

fred L. Ransome, pp. 159-197, 28 illus.; Short report on the geological formations encountered in driving the Mono Craters tunnel, compiled by W. K. Gresswell, pp. 199-204, 3 illus.; Methods and costs of mining and concentrating chromite, by Alfred Burch and Samuel H. Dolbear, pp. 205-210, 1 illus.

The following, included with report, was also distributed separately: Map of Mono County showing location of principal mining properties, scale 1″ = 6 mi.

(c) Chapter 3, California Journal of Mines and Geology, July 1940, pp. 231-320, i-xvi, pls. 2-3, 10 illus.

Contains: Economic mineral deposits of the Newberry and Ord Mountains, San Bernardino County, by W. B. Tucker and R. J. Sampson; pp. 232-254, 1 illus.; Current notes, by Olaf P. Jenkins, pp. 255-256; Geology of the Newberry and Ord Mountains, San Bernardino County, California, by Dion L. Gardner, pp. 257-292, pl. 2, 9 illus.; Notes on the geology of a portion of the Calico Mountains, San Bernardino County, California, by Homer D. Erwin and Dion L. Gardner, pp. 293-304, pl. 3; Study of chrome process aided by Martin Dennis Company, p. 305.

(d) Chapter 4, California Journal of Mines and Geology, October 1940, pp. 321-494, pls. 2-3, 54 illus.

Contains: Mineral resources of the Kernville quadrangle, by W. B. Tucker and R. J. Sampson, pp. 322-333, 1 illus.; Strategic problems of the mineral industry in California, by Olaf P. Jenkins, pp. 335-341; Descriptive geology of the Kernville quadrangle, California, by William J. Miller and Robert W. Webb, pp. 343-378, pl. 2, 31 illus.; Geology of the Big Blue group of mines, Kernville, California, by John W. Prout, Jr., pp. 379-421, pl. 3, 22 illus.; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 423-431; Strategic tax exemption, p. 432; Federal loans for strategic minerals, an Act, pp. 432-433; Index, pp. 481-494.

The following, included with report, was also distributed separately: Geologic map of Kernville quadrangle, California, scale 1″ = 2 mi.

Thirty-seventh Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1941. 656 pp., 3 pls., 1 map, 99 illus.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1941, pp. 1-200, i-xvi, pl. 1, 50 illus.

Contains: Mineral resources of Trinity County, by Charles V. Averill, pp. 8-89, pl. 1, 19 illus.; Current notes, by Olaf P. Jenkins, p. 90; Strategic minerals procurement, by Charles W. Merrill, pp. 91-100; Geological investigation of the chromite deposits of California, by John Eliot Allen, pp. 101-167, 31 illus.; United States Supreme Court renders far-reaching decision on power permits on "navigable" streams, pp. 169-183; Securities and Exchange Commission, Securities Act of 1933, pp. 184-189.

The following, included with report, was also distributed separately: Map of Trinity County showing locations of principal mineral deposits, scale 1″ = 4 mi.

(b) Chapter 2, California Journal of Mines and Geology, April 1941, pp. 201-372, i-xvii, 24 illus.

Contains: Current notes, by Olaf P. Jenkins, pp. 202-203; Geological progress of the California State Division of Mines, 1930 to 1940, by Olaf P. Jenkins, pp. 205-217; California earthquakes of the Mission period, 1769-1838, by Robert F. Heizer, pp. 219-223; Occurrence of scheelite in Idaho-Maryland mines at Grass Valley, California, by Rollin Farmin, p. 224; Tungsten resources of California, by John F. Partridge Jr., pp. 225-326, 22 illus.; Dragline dredging in Siskiyou County, by Charles V. Averill, pp. 328-331, 2 illus.; Marketing talc, pyrophyllite, and ground soapstone, by Bertrand L. Johnson, pp. 332-341; Manganese, by George L. Gary, pp. 342-344; Magnesite, by George L. Gary, pp. 345-347.

(c) Chapter 3, California Journal of Mines and Geology, July 1941, pp. 373-496, i-xvii, pls. 2-3, 1 map, 11 illus.

Contains: Mineral resources of Nevada County, by C. A. Logan, pp. 374-408, pls. 2-3, 1 map, 6 illus.; Mining methods and costs of the Lava

Cap Gold Mining Corporation, Nevada City, California, by John W. Chandler, pp. 409-436, 4 illus.; The price of gold, by Arthur B. Foote, pp. 437-468, 1 illus.; Current notes, by Olaf P. Jenkins, pp. 469-470; History of the names cobalt and nickel, by W. B. Winston, pp. 472-474; Aluminum, by George L. Gary, pp. 475-477; Quartz, by George L. Gary, pp. 478-482; New mining laws, an Act to amend Sec. 2313 of the Public Resources Code, pp. 483-485.

The following, included with report, were also distributed separately: Large-scale map, Grass Valley and Nevada City district, showing mining claims, scale $1\frac{3}{8}$" = 1 mi. Map of Western portion Nevada County, California, showing mining claims, scale 2" = 3 mi.

(d) Chapter 4, California Journal of Mines and Geology, October 1941, pp. 497-656, 14 illus.

Contains: Mineral resources of Humboldt County, by Charles V. Averill, pp. 499-528, 7 illus.; Tin in California, by Richard J. Segerstrom, pp. 531-557, 4 illus.; California quicksilver program of the Federal Geological Survey, by Edwin B. Eckel, pp. 558-563; Recent developments in the tungsten resources of California, by W. B. Tucker and R. J. Sampson, pp. 565-588, 3 illus.; New manganese and chrome ore specifications and prices, pp. 589-592; Does scheelite always fluoresce?, by George L. Gary, p. 593; Bentonite, by George L. Gary, pp. 594-596; Index, pp. 627-656.

Thirty-eighth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1942. 414 pp., 9 pls., 1 map, 100 figs.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1942, pp. 1-104, i-xvii, 19 figs.

Contains: Mines and mineral resources of Sierra County, by Charles V. Averill, pp. 7-67, 17 figs.; Chromium, by Charles V. Averill, pp. 70-93, 2 figs.

(b) Chapter 2, California Journal of Mines and Geology, April 1942, pp. 105-220, i-xvii, pls. 1-3, 30 figs.

Contains: Mineral resources of Imperial County, by R. J. Sampson and W. B. Tucker, pp. 105-145, pl. 1, 11 figs.; Geology and mineral deposits of the Cargo Muchacho Mountains, Imperial County, California, by Paul C. Henshaw, pp. 147-196, pls. 2-3, 15 figs.; Imperial carbon-dioxide gas field, by James C. Bransford, pp. 198-201, 4 figs.; The legendary "white metal" and its "ore", by C. W. Davis, pp. 202-205; Mine assessment work suspended on claims within withdrawn areas, an Act of Congress, p. 206.

The following, included with report, was also distributed separately: Map of Imperial County showing locations of principal mineral deposits, scale 2" = 15 mi.

(c) Chapter 3-4, California Journal of Mines and Geology, July-October 1942, pp. 221-414, pls. 4-9, 1 map, 51 figs.

Contains: Hot springs deposits of the Coso Mountains, by H. J. Fraser, H. D. B. Wilson, and N. W. Hendry, pp. 223-242, pls. 4-6, 1 map, 16 figs.; Contact-metamorphic rocks of the Twin Lakes region, Fresno County, California, by Charles W. Chesterman, pp. 243-282, pl. 7, 32 figs.; Tungsten deposits of the Confidence mining district, Tuolumne County, California, by James M. Little, pp. 283-290, pl. 8; Geology of the Welsh tungsten deposits, Madera County, California, by James M. Little, pp. 291-294, pl. 9; Ghost Canyon tungsten claims, Madera County, California, by James M. Little, pp. 295-302, 3 figs.; Tabulation of tungsten deposits of California to accompany economic mineral map No. 4, prepared under the direction of Olaf P. Jenkins, pp. 303-364; Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 367-378; Index, pp. 399-414.

The following, included with report, was also distributed separately: Outline geologic map of California showing locations of tungsten properties (Economic mineral map of California No. 4—Tungsten), scale 1:1,000,000.

Thirty-ninth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1943. 609 pp., 8 pls., 123 figs.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1943, pp. 1-110, i-xvi, pls. 1-2, 23 figs.

Contains: Mines and mineral resources of Santa Cruz County, by Henry G. Hubbard, pp. 11-52, pls. 1-2, 21 figs.; Discoveries in the strategic minerals, San Francisco field district, by C. McK Laizure, pp. 53-57; Current notes on activity in the strategic minerals, Los Angeles field district, by W. B. Tucker and R. J. Sampson, pp. 58-70; Current notes on activity in the strategic minerals, Sacramento field district, by Charles V. Averill, pp. 71-76, 2 figs.; Current notes on activity in the strategic minerals, Redding field district, by J. C. O'Brien, pp. 77-84; Current mining activity in Plumas County, by C. A. Logan, pp. 85-87; Current notes [Recent publications on strategic minerals by the U. S. Geological Survey], by Olaf P. Jenkins, pp. 88-89; Department of the Interior information service [Chromite deposits on North Elder Creek, Tehama County; Chromite deposits of McGuffy Creek area, Siskiyou County; Fairview and Ladd chromite deposits, Siskiyou County; Chromite deposits near San Luis Obispo; Manganese deposits of the Ladd-Buckeye area near Tracy; Quicksilver deposits of the New Idria district; New methods for determination of molybdenum in scheelite], by United States Geological Survey, pp. 90-102.

The following, included with report, was also distributed separately: Map of Santa Cruz County (showing location of principal mineral properties), scale 1" = 3 mi.

(b) Chapter 2, California Journal of Mines and Geology, April 1943, pp. 111-292, i-xvi, pls. 3-4, 44 figs.

Contains: Manganese discovery in San Mateo County, by Henry G. Hubbard, p. 117, 1 fig.; Current mining activity in southern California, by W. B. Tucker and R. J. Sampson, pp. 118-138, 2 figs.; Current notes on activity in the strategic minerals, Sacramento field district, by Charles V. Averill, pp. 139-141, 1 fig.; Clerbus-Mae tungsten prospect, Trinity County, by J. C. O'Brien, p. 142; Current notes, by Olaf P. Jenkins, pp. 143-144, 1 fig.; Mylonites in the eastern San Gabriel Mountains, by Raymond M. Alf, pp. 145-151, 6 figs.; Geology of the Sierra Nevada northeast of Visalia, Tulare County, California, by Cordell Durrell, pp. 153-168, pls. 3-3A; Tungsten deposits northeast of Visalia, by Willian O. Jenkins, pp. 169-182, 3 figs.; Geology of the San Benito quadrangle, California, by Ivan F. Wilson, pp. 183-270, pl. 3, 30 figs.; Lithium, by George L. Gary, pp. 276-278; Quartz, by W. B. Winston, pp. 278-284.

The following, included with report, was also distributed separately: Geologic map of the San Benito quadrangle, California, scale 1:62,500, pl. 3.

(c) Chapter 3, California Journal of Mines and Geology, July 1943, pp. 293-420, i-xvii, 25 figs.

Contains: Carbon dioxide gas occurrences in Mendocino and northern Sonoma Counties, by Henry G. Hubbard, pp. 301-309, 8 figs.; Current notes on activity in the strategic minerals, Sacramento field district, by Charles V. Averill, pp. 311-322, 4 figs.; Current notes on the activity in the strategic minerals, Redding field district, by J. C. O'Brien, pp. 323-330; Crestmore minerals, by A. O. Woodford, pp. 333-365, 7 figs., The isometrograph as developed and used at the New Idira quicksilver mine, by J. McLaren Forbes, pp. 367-376, 6 figs.; Discussion of Bulletin 118 —notes relating to Sutter (Marysville) Buttes gas field, by Walter Stalder, pp. 377-381; The sillimanite group of minerals, by Joseph A. Jeffery, pp. 383-390; New federal and state legislation affecting mining, pp. 391-409.

(d) Chapter 4, California Journal of Mines and Geology, October 1943, pp. 421-609, pls. 5-8, 31 figs.

Contains: Mineral resources of San Bernardino County, by W. B. Tucker and R. J. Sampson, pp. 427-549, pls. 5-7, 27 figs.; Current notes on activity in the strategic minerals, Sacramento field district, by Charles

V. Averill, pp. 551-559, 4 figs.; Current notes, by Olaf P. Jenkins, pp. 560-561, pl. 8; Geologic map of a portion of the Foothill copper belt, Calaveras County, California, by Stanford Geological Survey, pl. 8; Index, pp. 593-609.

The following, included with report, was also distributed separately: Map of San Bernardino County, California, showing locations of mines and mineral deposits, scale 1″ = 8 mi.

Fortieth Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1944. 509 pp., 12 pls., 8 maps, 97 figs.

Issued also in separate chapters. as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1944, pp. 1-162, pls. 1-7, 43 figs.

Contains: Geology of Palm Springs-Blythe strip, Riverside County, California, by William J. Miller, pp. 11-72, pls. 1-4, 23 figs.; Geology of parts of the Barstow quadrangle, San Bernardino County, California, by William J. Miller, pp. 73-112, pls. 5-6, 18 figs.; Geology of the Needles-Goffs region, San Bernardino County, California, by William J. Miller, pp. 113-129, pl. 7, 1 fig.; Airox concrete aggregate, by S. G. Dolman, pp. 131-133, 1 fig.; Marketing magnesite and allied products, by Charles L. Harness and Nan C. Jensen, pp. 134-149.

(b) Chapter 2, California Journal of Mines and Geology, April 1944, pp. 163-282, i-xvii, pls. 8-10, 32 figs.

Contains: Status of topographic and geologic mapping in California, by Olaf P. Jenkins, pp. 171-176, pl. 8; Geology of the Jamesburg quadrangle, Monterey County, California, by William Morris Fiedler, pp. 177-250, pls. 9-10, 32 figs.

The following, included with report, were also distributed separately: Map of California showing progress in topographic quadrangles and geologic maps, scale 1″ = 40 mi. (approx.); and Map of California showing distribution of mineral deposits, scale 1″ = 40 mi. (approx.); Geologic map of the Jamesburg quadrangle, Monterey County, California, scale 1:62,500; and Structure sections across Jamesburg quadrangle, Monterey County, California.

(c) Chapter 3, California Journal of Mines and Geology, July 1944, pp. 283-392, i-xvii, 8 maps, 12 figs.

Contains: Progress on revision of Bulletin 113, Minerals of California, by Joseph Murdoch and Robert W. Webb, p. 290; Mines and quarries of the Indians of California, by Robert F. Heizer and Adam E. Treganza, pp. 291-359, 8 maps, 11 figs.; Fluorescent minerals in the exhibit of the State Division of Mines, by Henry H. Symons, pp. 361-368, 1 fig.; Fluorescent minerals used in lighting and elsewhere, by Oliver C. Ralston and A. George Stern, pp. 369-380.

(d) Chapter 4, California Journal of Mines and Geology, October 1944, pp. 393-500, pls. 11-12, 9 figs.

Contains: Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 401-408; Pellet phosphorite from Carmel Valley, Monterey County, California, by Austin F. Rogers, pp. 411-421, 6 figs.; Geology of the quartz-crystal mines near Mokelumne Hill, Calaveras County, California, by Cordell Durrell, pp. 423-433, pls. 11-12, 3 figs.; Strategic mica, by G. Richards Gwinn, pp. 435-447; Additional note on strategic mica, by Charles V. Averill, pp. 448-449; Marketing vermiculite, by G. Richards Gwinn, pp. 450-459; An Act providing for the suspension of certain requirements relating to work on tunnel sites, p. 460; An Act regulating mineral, oil, and gas brokers and salesmen, pp. 461-470; Index, pp. 501-509.

Forty-first Report of the State Mineralogist; Walter W. Bradley, State Mineralogist. 1945. 401 pp., 50 pls., 12 figs.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1945, pp. 1-54, i-xviii, pls. 1-5, 3 figs.

Contains: Quicksilver deposits of central San Benito and northwestern Fresno Counties, California, by Robert G. Yates and Lowell S. Hilpert,

pp. 11-35, pls. 1-5, 3 figs.; War-time mineral industry of California, by Spangler Ricker, pp. 37-44.

(b) Chapter 2, California Journal of Mines and Geology, April 1945, pp. 55-110, i-xviii, pls. 6-22, 2 figs.

Contains: Quicksilver deposits of the Knoxville district, Napa, Yolo, and Lake Counties, California, by Paul Averitt, pp. 65-89, pls. 6-14, 2 figs.; Unexpected use transforms outlook for quicksilver, by H. H. Wanders, pp. 91-92; Steel, by William H. Popert, pp. 93-96, pls. 15-22.

(c) Chapter 3, California Journal of Mines and Geology, July 1945, pp. 111-220, i-xviii, pls. 23-35.

Contains: Mineral resources of Riverside County, by W. B. Tucker and R. J. Sampson, pp. 121-182, pls. 23-35; Recent legislation affecting mining, pp. 183-191; Carbon, by W. B. Winston, pp. 196-208; Fluorspar, by W. B. Winston, pp. 209-212.

The following, included with report, is also distributed separately: Map of Riverside County, California, showing locations of mines and mineral deposits, scale 1" = 6 mi.

(d) Chapter 4, California Journal of Mines and Geology, October 1945, pp. 221-401, pls. 36-50, 7 figs.

Contains: Pine Creek and Adamson tungsten mines, Inyo County, California, by Paul C. Bateman, pp. 231-249, pls. 36-47, 1 fig.; Index to topographic quadrangles of California, by Mary H. Helm with Introduction by Olaf P. Jenkins, pp. 251-360, 6 figs.; Flow-sheet of American Potash and Chemical Corporation at Searles Lake, California, by Walter W. Bradley, pp. 361-363, pls. 48-50; Index, pp. 393-401.

Forty-second Report of the State Mineralogist; Walter W. Bradley, W. B. Tucker, State Mineralogists. 1946. 430 pp., 55 pls., 40 figs.

Issued also in separate chapters, as indicated below.

(a) Chapter 1, California Journal of Mines and Geology, January 1946, pp. 1-73; i-xviii, pls. 1-7, 8 figs.

Contains: Geology of Santa Rosa Mountain area, Riverside County, California, by Lawrence B. Wright, pp. 9-13, pl. 1, 2 figs.; Geology and nickel mineralization of the Julian-Cuyamaca area, San Diego County, California, by S. C. Creasey, pp. 15-29, pls. 2-4, 2 figs.; Tin deposits of the Gorman district, Kern County, California, by John H. Wiese and Lincoln R. Page, pp. 31-52, pls. 5-7, 4 figs.; California minerals for tomorrow, by Walter W. Bradley, pp. 53-56; Relocation of claim by original locator, State of California District Court appeal, pp. 57-60.

(b) Chapter 2, California Journal of Mines and Geology, April 1946, pp. 74-164, i-xviii, pls. 8-22, 17 figs.

Contains: Quicksilver deposits of the New Idria district, San Benito and Fresno Counties, California, by Edwin B. Eckel and W. B. Myers, pp. 81-124, pls. 8-20, 9 figs.; Quicksilver deposits at the Sulphur Bank mine, Lake County, California, by Donald L. Everhart, pp. 125-153, pls. 21-22, 8 figs.

(c) Chapter 3, California Journal of Mines and Geology, July 1946, pp. 165-310, pls. 23-50, 11 figs.

Contains: Biennial report of the State Mineralogist, by Walter W. Bradley, pp. 173-182; Mines and mining in Tehama County, California, by J. C. O'Brien, pp. 183-195, pls. 23-38; Progress on revision of Bulletin 113, "Minerals of California," with notes on some new occurrences, by Joseph Murdoch, pp. 197-198; Quicksilver deposits of the western Mayacmas district, Sonoma County, California, by Edgar H. Bailey, pp. 199-240, frontispiece, pls. 30-33, 3 figs.; Quicksilver deposits of eastern Mayacmas district, Lake and Napa Counties, California, by Robert G. Yates and Lowell S. Hilpert, pp. 231-286, pls. 29, 34-47, 8 figs.; Minerals at "The Geysers," Sonoma County, California, by M. Vonsen, pp. 287-293, pl. 48; Observations at "The Geysers," Sonoma County, California, by Walter W. Bradley, pp. 295-298, pls. 49-50.

The following, included with report, were also distributed separately: Map of Tehama County, California, showing locations of principal

mineral deposits, scale 1" = 6 mi., approx.; Geologic map and sections of the Mayacmas quicksilver district, Sonoma, Lake, and Napa Counties, scale 1" = 1 mi.

(d) Chapter 4, California Journal of Mines and Geology, October 1946, pp. 311-430, pls. 51-55, 4 figs.

Contains: Current notes [Millspaugh iron deposit, Inyo County; Tiefort Mountains iron deposit, San Bernardino County], by W. B. Tucker, p. 319; The Map Information Office of the Geological Survey, by C. F. Feuchsel, pp. 321-324; Geology of the Kramer borate district, Kern County, California, by Hoyt S. Gale, pp. 325-378, pls. 51-55, 4 figs.; Salt, the most useful of mineral substances, by E. B. Tustin Jr., pp. 379-383; Index, pp. 421-430.

For Reports 43 to 54, see *California Journal of Mines and Geology.*

Fifty-fifth Report of the State Mineralogist; Gordon B. Oakeshott, State Mineralogist and Chief, Division of Mines. 1959. 244 pp., 8 figs., 28 photos, frontis. map.

Contains: Annual report of the State Mineralogist, Chief, Division of Mines, for the 109th fiscal year [1957-58], by Gordon B. Oakeshott and staff, pp. 7-88, 7 figs., 23 photos (includes Report of the U. S. Geological Survey on cooperative studies of mineral deposits in California, fiscal year 1958, by Preston E. Hotz, pp. 81-85); California mineral commodities in 1956 and 1957, by Henry H. Symons and Fenelon F. Davis, pp. 89-153, 1 fig., 5 photos; Directory of California mineral producers, dealers, and laboratories, by Henry H. Symons and Fenelon F. Davis, pp. 155-211; Metal, mineral, and mineral fuel review for the United States for 1957, by U. S. Bureau of Mines, pp. 213-244 (includes Foreword, by Charles W. Merrill, p. 214; Aluminum, by R. A. Hindl, pp. 214-215; Antimony, by H. M. Callaway, p. 215; Arsenic, by A. D. McMahon, p. 215; Asbestos, by D. O. Kennedy, p. 215; Barite, by A. E. Schreck, p. 216; Bauxite, by R. C. Wilmot, pp. 216-217; Beryllium, by Donald E. Eilertsen, p. 217; Bismuth, by H. M. Callaway, p. 217; Bituminous coal and lignite, by T. Reed Scollon, pp. 217-218; Boron, by Henry E. Stipp, p. 218; Cadmium, by Arnold M. Lansche, p. 218; Carbon black, by James G. Kirby, p. 218; Cement, by D. O. Kennedy, p. 219; Chromium, by Wilmer McInnis, p. 219; Clays, by Brooke L. Gunsallus, p. 220; Cobalt, by Hubert W. Davis, p. 220; Columbium (niobium) and tantalum, by William R. Barton, pp. 220-221; Copper, by A. D. McMahon, p. 221; Crude petroleum, by James G. Kirby, pp. 221-222; Diamons (industrial) and substitutes, by Henry P. Chandler, p. 222; Feldspar, by Taber de Polo, p. 222; Fluorspar, by R. B. McDougal, p. 223; Gold, by J. P. Ryan, pp. 223-224; Graphite, by Donald R. Irving, p. 224; Gypsum, by Leonard P. Larson, pp. 224-225; Helium, by Henry P. Wheeler Jr., p. 225; Iron ore, by Horace T. Reno, pp. 225-226; Lead, by O. M. Bishop, p. 226; Lithium, by A. E. Schreck, pp. 226-227; Magnesium (including magnesium compounds), by H. B. Comstock, p. 227; Manganese, by G. L. DeHuff Jr., pp. 227-228; Mercury, by James W. Pennington, p. 228; Mica, by Milford L. Skow, pp. 228-229; Molybdenum, by Wilmer McInnis, p. 229; Natural gas, by James G. Kirby, p. 230; Natural-gas liquids, by James G. Kirby, p. 230; Nickel, by Hubert W. Davis, p. 230; Pennsylvania anthracite, by J. A. Corgan, p. 231; Perlite, by L. M. Otis, p. 231; Phosphate rock, by E. Robert Ruhlman, p. 231; Platinum-group metals, by J. P. Ryan, p. 232; Potash, by E. Robert Ruhlman, p. 233; Rare-earth metals, by Charles T. Baroch, p. 233; Sand and gravel, by W. W. Key, pp. 233-234; Selenium, by Frank L. Fisher, p. 234; Silver, by J. P. Ryan, pp. 234-235; Steel, by James C. O. Harris, pp. 235-236; Stone, by W. W. Key, p. 237; Sulfur, by L. P. Larson, p. 237; Talc, soapstone, and pyrophyllite, by Donald R. Irving, p. 238; Thorium, by James Paone, p. 238; Tin, by James W. Pennington, p. 239; Titanium, by F. J. Cservenyak, pp. 239-240; Tungsten, by Robert W. Holliday, pp. 240-241; Uranium, by James Paone, p. 241-242; Vanadium, by Phillip M. Busch, p. 242; Zinc, by O. M. Bishop, pp. 242-243; Zirconium and hafnium, by F. W. Wessel, pp. 243-244).

Fifty-sixth Report of the State Mineralogist; Gordon B. Oakeshott, Ian Campbell, State Mineralogist and Chief, Division of Mines. 1960. 219 pp., 8 figs., 21 photos, 35 tables, frontis. map.

Contains: Annual report of the State Mineralogist, Chief, Division of Mines, for the 110th fiscal year [1958-59], by Ian Campbell and staff, pp. 7-75, 5 figs., 16 photos, 9 tables (includes Report of the U. S. Geological Survey on cooperative studies of mineral deposits in California, fiscal year 1959, by Preston E. Hotz, pp. 64-68); Summary of work in California by the Geological Division, U. S. Geological Survey, by Charles A. Anderson, pp. 77-87, with an Introductory note, by Ian Campbell, p. 77; California mineral commodities in 1958, by Henry H. Symons and Fenelon F. Davis, pp. 88-132, 3 figs., 5 photos, 26 tables; Directory of California mineral producers, dealers, and laboratories, 1959, by Henry H. Symons and Fenelon F. Davis, pp. 133-187; Metal, mineral, and mineral fuel review for 1958 [U. S. Bureau of Mines], [by] Charles W. Merrill, pp. 189-219 (includes Aluminum, by R. A. Heindl, p. 189: Pennsylvania anthracite, by J. A. Corgan, pp. 189-190; Antimony, by H. M. Callaway, p. 190; Arsenic, by A. D. McMahon, p. 190; Asbestos, by D. O. Kennedy, pp. 190-191; Barite, A. E. Schreck, p. 191; Bauxite, by R. C. Wilmot, p. 191; Beryllium, by Donald E. Eilertsen, p. 192; Bismuth, by H. M. Callaway, p. 192; Bituminous coal and lignite, by T. Reed Scollon, pp. 192-193; Boron, by Henry E. Stipp, p. 193; Cadmium, by Arnold M. Lansche, p. 193; Carbon black, by James G. Kirby, p. 194; Cement, by D. O. Kennedy, p. 194; Chromium, by Wilmer McInnis, pp. 194-195; Clays, by Brooke L. Gunsallus, p. 195; Cobalt, by Joseph H. Bilbrey Jr., pp. 195-196; Columbium and tantalum, by William R. Barton, p. 196; Copper, by A. D. McMahon, p. 197; Diamonds (industrial) and substitutes, by Henry P. Chandler, p. 197; Feldspar, by Taber de Polo, pp. 197-198; Fluorspar, by Robert B. McDougal, pp. 198-199; Gallium, by Donald E. Eilertsen, p. 199; Germanium, by Frank L. Fisher, p. 199; Gold, by J. P. Ryan, pp. 199-200; Graphite, by Donald R. Irving, p. 200; Gypsum, by L. P. Larson, p. 201; Helium, by Henry P. Wheeler Jr., p. 201; Iron ore, by Horace T. Reno, p. 202; Lead, by O. M. Bishop, p. 202; Lithium, by A. E. Schreck, p. 203; Magnesium (including magnesium compounds), by H. B. Comstock, pp. 203-204; Manganese, by Gilbert DeHuff Jr., pp. 204-205; Mercury, by James W. Pennington, p. 205; Mica, by G. Richards Gwinn, p. 205; Molybdenum, by Wilmer McInnis, pp. 205-206; Natural gas, by James G. Kirby, p. 206; Natural-gas liquids, by James G. Kirby, p. 206; Nickel, by Joseph H. Bilbrey Jr., p. 207; Perlite, by L. M. Otis, pp. 207-208; Crude petroleum, by James G. Kirby, p. 208; Phosphate rock, by E. Robert Ruhlman, p. 208; Platinum-group metals, by J. P. Ryan, pp. 208-209; Potash, by E. Robert Ruhlman, p. 209; Rare-earth metals, by Walter E. Lewis, pp. 209-210; Sand and gravel, by W. W. Key, p. 210; Selenium, by Frank L. Fisher, pp. 210-211; Silver, by J. P. Ryan, p. 211; Steel, by James C. O. Harris, pp. 211-212; Stone, by W. W. Key, p. 213; Sulfur, by L. P. Larson, pp. 213-214; Talc, soapstone, and pyrophyllite, by Donald R. Irving, p. 214; Tellurium, by Frank L. Fisher, p. 214; Thorium, by James Paone, pp. 214-215; Tin, by James W. Pennington, p. 215; Titanium, by John W. Stamper, pp. 215-216; Tungsten, by Robert W. Holliday, pp. 216-217; Uranium, by James Paone, p. 217; Vanadium, by Phillip M. Busch, p. 218; Zinc, by O. M. Bishop, p. 218; Zirconium and hafnium, by F. W. Wessel, p. 219).

Fifty-seventh Report of the State Mineralogist; Ian Campbell, State Mineralogist and Chief, Division of Mines. 1961. [In press]

Contains: Report of the Division of Mines for the 111th fiscal year, by Ian Campbell and Staff; California mineral commodities in 1959, by Fenelon F. Davis; Directory of mineral producers in 1959, by Fenelon F. Davis and Harold B. Goldman; Activities of the Geologic Division, U.S. Geological Survey in California in 1959-60, by Charles A. Anderson.

The Ferry Building—a San Francisco landmark—headquarters of the California Division of Mines since 1889. *Photo by "Dick" Whittington, courtesy Port of San Francisco.*

Half Dome in Yosemite Valley, famed beauty spot in Mariposa County. Description of the mines, mineral resources, and geology of this county is presented in the *California Journal of Mines and Geology* for January-April 1957. *Photo by Mary Hill.*

CALIFORNIA JOURNAL OF MINES AND GEOLOGY (J)

Volumes 43 to 54, inclusive, of Reports of the State Mineralogist were published quarterly under the title *California Journal of Mines and Geology*. With volume 54, this serial was discontinued, and the Reports of the State Mineralogist reinstated.

California Journal of Mines and Geology, volume 43; Olaf P. Jenkins, Chief. 1947. 502 pp., 43 pls., 1 map, 9 figs.

Issued also in separate parts, as indicated below.

(a) No. 1 (January), pp. 1-75, pls. 1-12, 1 fig.

Contains: Walibu quicksilver mine, Kern County, California, by Edgar H. Bailey and C. Melvin Swinney, pp. 9-14, pls. 1-2, 1 fig.; Mines and mineral resources of Lake County, California, by Charles V. Averill, pp. 15-40, pls. 3-7; Mines and mineral resources of San Benito County, California, by Charles V. Averill, pp. 41-60, pls. 8-10; Condenser installation at the New Idria Quicksilver Mining Company, Idria, California, by Richard A. Crippen, Jr., pp. 61-62, pls. 11-12; Information in regard to mining claims on the public domain, pp. 63-66; Mineral patents, pp. 67-75.

The following, included with the report, was also distributed separately: Map of Lake County, California, showing location of principal mineral deposits, scale 1" = 3 mi.

(b) No. 2 (April), pp. 79-162, pls. 13-20, 3 figs.

Contains: Mines and mineral resources of Stanislaus County, California, by Abbott Charles, pp. 85-100, pls. 13-15; Vanadium, by W. B. Winston, pp. 101-104; Fifty years of operation by The Mountain Copper Company, Ltd., in Shasta County, California, by William F. Kett, pp. 105-162, pls. 16-19, 3 figs.

The following, included with the report, was also distributed separately: Map of Stanislaus County, California, showing locations of principal mineral deposits, scale $\frac{3}{8}$" = 1 mi.

(c) No. 3 (July), pp. 163-358, pls. 21-37, 2 figs., map.

Contains: Status of topographic mapping in the United States, by the Map Information Office of the U.S. Geological Survey, pp. 169-173, map; Limestone in California, by Clarence A. Logan, pp. 175-357, pls. 21-37, 2 figs.

(d) No. 4 (October), pp. 359-502, pls. 38-43, 3 figs.

Contains: Annual report, Division of Mines, for the ninety-eighth fiscal year, July 1, 1946 to June 30, 1947, by Olaf P. Jenkins, pp. 365-412, 3 figs; Mines and mineral resources of Siskiyou County, by J. C. O'Brien, pp. 413-462, pls. 38-43; Silver, by W. B. Winston, pp. 463-468; Pumice, by W. B. Winston, pp. 469-479; Index to volume 43, pp. 481-502.

Issued also in separate parts, as indicated below.

The following, included with the report, were also distributed separately: The mineral industry of California in 1947, compiled by Charles V. Averill and Olaf P. Jenkins (issued as preprint of part of Annual Report). Map of western portion, Siskiyou County, California, showing locations of mines and mineral deposits, scale 1" = 3 mi. (approx.); and Map of eastern portion of Siskiyou County, California, showing locations of mineral deposits, scale 1" = 3 mi.

California Journal of Mines and Geology, volume 44, Olaf P. Jenkins, Chief. 1948. 524 pp., 59 pls., 27 figs., 4 charts.

Issued also in separate parts, as indicated below.

(a) No. 1 (January), pp. 1-122, pls. 1-9, 2 figs.

Contains: Trends in the foundry-sand industry, by Leonard O. Hofstetter, pp. 7-8; Properties of foundry sands, by Heinrich Ries, pp. 9-35,

pl. 1, 1 fig.; California foundry sands, by Lauren A. Wright, pp. 36-72, pls. 2-9, 1 fig.; Uranium, by W. B. Winston, pp. 73-92; Manner of locating and holding mineral claims in California, by A. H. Ricketts, pp. 93-122.

(b) No. 2 (April), pp. 123-242, pls. 10-39, charts 1-4.

Contains: The basement complex in well samples from the Sacramento and San Joaquin Valleys, California, by J. C. May and R. L. Hewitt, pp. 129-158, pls. 10-17, charts 1-4; Mines and mineral resources of Napa County, California, by Fenelon F. Davis, pp. 159-188, pls. 18-22; Soda ash and saltcake in California, by Clarence R. King, pp. 189-200; The lakes of California, by William Morris Davis, pp. 201-242, pls. 24-39.

(c) No. 3 (July), pp. 243-320, pls. 40-51, 5 figs.

Contains: Unusual concentrations from Templeton, San Luis Obispo County, California, by R. A. Crippen, pp. 249-252, pls. 40-43; Quicksilver deposits of the Guerneville district, Sonoma County, California, by W. Bradley Myers and Donald L. Everhart, pp. 253-277, pls. 44-51, 5 figs.; Mining law in recent years, by William E. Colby (first of three articles), pp. 279-292; Pumice and perlite as industrial materials in California, by Clarence R. King, pp. 293-319.

(d) No. 4 (October), pp. 321-524, pls. 52-59, 20 figs.

Contains: Economic aspects of mercury production in California, by C. R. King, pp. 327-334, 2 figs.; Current and recent mining activities in the Redding district, by J. C. O'Brien, pp. 335-378, pls. 52-55; The spectrograph and polarograph, by John Herman, pp. 379-409, pls. 56-59, 18 figs.; Public Resources Code, pp. 411-415; U. S. Atomic Energy Commission announces program to stimulate production of domestic uranium, pp. 417-425; Publications of the California State Division of Mines, by Elisabeth L. Egenhoff, Beth Collins, and Mary-Louise Burgess, pp. 427-516; Index to volume 44, pp. 517-524.

California Journal of Mines and Geology, volume 45; Olaf P. Jenkins, Chief. 1949. 590 pp., 26 pls., 11 figs.; Supplement, 128 pp., 71 illus.

Issued also in separate parts, as indicated below.

(a) No. 1 (January), pp. 1-116, pls. 1-8, 4 figs.

Contains: Annual report, Division of Mines, for the ninety-ninth fiscal year, July 1, 1947, to June 30, 1948, by Olaf P. Jenkins, pp. 7-29; Quicksilver deposits of the Oakville district, Napa County, California, by Philip F. Fix and C. Melvin Swinney, pp. 31-46, pls. 1-3, 2 figs.; Mines and mineral resources of Tuolumne County, California, by Clarence A. Logan, pp. 47-83, pls. 4-8; Barium, by W. B. Winston, pp. 85-97; Penn mine slag dump and mine water, Calaveras County, California, by Frank J. Wiebelt and Spangler Ricker, pp. 99-105, 2 figs.; Division of Mines publications issued September 1, 1948, to November 30, 1948, pp. 107-108; Map symbols used in publications of the U. S. Geological Survey, pp. 109-116.

The following, included with report, was also distributed separately: Map of western third of Tuolumne County, California, showing mining claims and prospects, scale 1″ = 1 mi. (approx.)

(b) No. 2 (April), pp. 117-358, pls. 9-18, 2 figs.

Contains: Water-flooding as a method of increasing California oil production (Part 1, Factors influencing the application of water-flooding), by Wilbur H. Somerton, pp. 123-202, 1 fig.; Mineral resources of Kern County, California, by W. B. Tucker, R. J. Sampson, and G. B. Oakeshott, pp. 203-297, pls. 9-18, 1 fig.; State geological surveys, by Wilson M. Laird, pp. 299-317; Industrial uses of limestone and dolomite, by Oliver Bowles and Nan C. Jensen, pp. 319-334; An Act for the development and control of atomic energy, pp. 335-356; Division of Mines publication issued September 1, 1948, to February 15, 1949, p. 357.

The following, included with report, were also distributed separately: Map of Kern County, California, showing locations of mines and prospects, scale 1¼″ = 6 mi. (approx.); Map of western portion of Kern County, California, showing oil and gas fields and producing areas, scale 1″ = 3 mi. (approx.)

(c) No. 3 (July), pp. 359-502, pls. 19-23, 2 figs.

Contains: Water-flooding as a method of increasing California oil production (Part 2, A survey of California conditions relative to the application of water-flooding), by Wilbur H. Somerton, pp. 363-416; Mines and mineral resources of Butte County, California, by J. C. O'Brien, pp. 417-454, pls. 19-23; Roofing granules in the southwest, by Stuart H. Ingram, pp. 455-458; The western pulp and paper industry as a consumer of chemicals, by R. G. Mispley, pp. 459-464; Mining law in recent years, by William E. Colby (second of three articles), pp. 465-490; Ione-Carbondale clays, Amador County, California, by F. T. Johnson and Spangler Ricker, pp. 491-498, 3 figs.; Address of Governor Earl Warren to the American Institute of Mining and Metallurgical Engineers, Inc., San Francisco, California, February 14, 1949, pp. 499-502.

The following, included with report, was also distributed separately: Map of Butte County showing location of mines and prospects, scale 1" = 3 mi.

(d) No. 4 (October), pp. 503-590, pls. 24-26, 2 figs.; supplement, 128 pp., 71 illus.

Contains: Geology of limestone near Sonora, Tuolumne County, California, by George R. Heyl and John H. Wiese, pp. 509-513, pls. 24-25; Geology of limestone near Gazelle, Siskiyou County, California, by George R. Heyl and George W. Walker, pp. 514-520, pl. 26, 2 figs.; Minerals of California—supplement no. 1 to Bulletin 136, by Joseph Murdoch, pp. 521-540; Water-flooding as a method of increasing California oil production (Part 3, Current and proposed water-flooding research in California), by Wilbur H. Somerton, pp. 541-551; Materials of inorganic mineral origin used in the rubber industry, by Erle C. Zimmerman, pp. 553-561; Division of Mines publications issued May 1, 1949 to October 1, 1949, p. 562; Index to volume 45, pp. 563-590; Supplement, The elephant as they saw it, by Elisabeth L. Egenhoff, 128 pp. 71 illus.

The following, included in the *Journal,* was also distributed separately: The elephant as they saw it—a collection of contemporary pictures and statements on gold mining in California, assembled by Elisabeth L. Egenhoff as a centennial supplement to the California Journal of Mines and Geology for October 1949, 128 pp., 70 illus., colored frontispiece; 1st ed., 1949; 2d ed., 1953.

California Journal of Mines and Geology, volume 46; Olaf P. Jenkins, Chief. 1950. 526 pp., 78 pls., 33 figs.

Issued also in separate parts as indicated below.

(a) No. 1 (January), pp. 1-184, pls. 1-22, 12 figs.

Contains: Submarine phosphorite deposits off California and Mexico, by K. O. Emery and R. S. Dietz, pp. 7-15, pls. 1-5; Geology along the Electra and West Point tunnels, Amador County, California, by John H. Wiese, Arvid A. Stromquist, John H. Eric, and C. Melvin Swinney, pp. 17-22, pl. 6, fig. 1; Geology and tungsten deposits of the Tungsten Hills, Inyo County, California, by Paul C. Bateman, Max P. Erickson, and Paul D. Proctor, pp. 23-42, pls. 7-13, 3 figs.; Geology of the Placerita oil field, Los Angeles County, California, by Gordon B. Oakeshott, pp. 43-79, pls. 14-21, 3 figs.; Perlite deposits in Sonoma County, California, by Charles W. Chesterman, pp. 81-82; Mines and mineral resources of Sonoma County, California, by Martin T. Honke Jr. and William E. Ver Planck Jr., pp. 83-141, pl. 22, 2 figs.; Annual report of the State Mineralogist, Chief of the Division of Mines for the One-Hundredth fiscal year, July 1, 1948 to June 30, 1949, by Olaf P. Jenkins, pp. 143-184, 3 figs.

The following, included with report, was also distributed separately: Map showing mines and mineral deposits of Sonoma County, California, scale ½" = 1 mi.

(b) No. 2 (April), pp. 185-348, pls. 23-58, 12 figs.; supplement 31 pp.

Contains: Geology and oil prospects of western San Jose Hills, Los Angeles County, California, by Franklin H. Olmsted, pp. 191-212, pls. 23-28, 2 figs.; Ironstone concretions and beach ridges of San Diego County, California, by K. O. Emery, pp. 213-221, pls. 29-33, 2 figs.; Geology of the Red Mountain magnesite district, Santa Clara and Stanislaus Counties, California, by Alfred J. Bodenlos, pp. 223-278, pls. 34-49, 7

figs.; Mines and mineral resources of Alameda County, by Fenelon F. Davis, pp. 279-346, pls. 50-58, 1 fig.; Supplement, Manner of locating and holding mineral claims in California, by A. H. Ricketts, revised by C. A. Logan and Charles V. Averill, 31 pp.

The following, included with report, were also distributed separately: Manner of locating and holding mineral claims in California, by A. H. Ricketts, revised by C. A. Logan and Charles V. Averill, 31 pp. Map of Alameda County, California, showing location of mines and mineral deposits, scale 1" = 2 mi.

(c) No. 3 (July), pp. 349-436, pls. 59-72, 6 figs.

Contains: Needles magnesite deposit, San Bernardino County, California, by Charles J. Vitaliano, pp. 357-372, pls. 59-65, 2 figs.; Northern California as a market for chemicals, E. William Eipper, ed., pp. 373-384; Skaggs Springs quicksilver mine, Sonoma County, California, by Donald L. Everhart, pp. 385-394, pls. 66-69, 2 figs.; The Altoona quicksilver mine, Trinity County, California, by C. Melvin Swinney, pp. 395-404, pls. 70-71, 1 fig.; Health and safety work of the Bureau of Mines, by James Boyd, pp. 405-419; Mines and mineral resources of Yolo County, by J. C. O'Brien, pp. 421-436, pl. 72, 1 fig.

The following, included with report, was also distributed separately: Map showing mines and mineral deposits of Yolo County, California, scale ¾" = 1 mi.

(d) No. 4 (October), pp. 437-562, pls. 73-78, 3 figs.

Contains: Mines and mineral resources of Madera County, by C. A. Logan, pp. 445-482, pls. 73, 2 figs.; Mining law in recent years (third of three articles), by William E. Colby, pp. 483-508; Quicksilver deposits of the Cachuma district, Santa Barbara County, California, by Donald L. Everhart, pp. 509-532, pls. 74-78, 2 fig.; Index to volume 46, pp. 533-562.

The following, included with report, was also distributed separately: Map of Madera County showing location of mines and mineral deposits, scale 1" = 6 mi.

California Journal of Mines and Geology, volume 47; Olaf P. Jenkins, Chief. 1951. 680 pp., 47 pls., 26 figs.

Issued also in separate parts as indicated below.

(a) No. 1 (January), pp. 1-223, pls. 1-18, 11 figs. 1st printing, 1951. 2d printing, 1952.

Contains: Limestone in the California beet sugar industry, by F. H. Ballou Jr., pp. 9-16, 2 figs.; Mines and mineral resources of Inyo County, by L. A. Norman Jr. and Richard M. Stewart, pp. 17-223, pls. 1-18, 9 figs.

The following, included with report, was also distributed separately: Map showing mines and mineral deposits of Inyo County, California, scale 1" = 6 mi. 1st printing, 1951; 2d printing, 1956.

(b) No. 2 (April), pp. 224-464, pls. 19-30, 3 figs.; supplement, 117 pp.

Contains: Annual report of the State Mineralogist, Chief of the Division of Mines, for the 101st fiscal year, July 1, 1949 to June 30, 1950, by Olaf P. Jenkins, pp. 230-270, 3 figs.; Counties of California—mineral production and significant mining activities of 1949, prepared under the direction of Charles V. Averill and L. A. Norman Jr., contributing authors Charles V. Averill, James W. Crosby III, Fenelon F. Davis, George C. Hazenbush, L. A. Norman Jr., John C. O'Brien, Salem J. Rice, Richard M. Stewart, Henry H. Symons, Mort D. Turner, James W. Vernon, Lauren A. Wright, pp. 271-464, pls. 19-30; Supplement, Publications of the California State Division of Mines (to March 1, 1951), by Elisabeth L. Egenhoff, Beth Collins, and Mary-Louise Burgess, pp. 1-117.

The following, included with report, was also distributed separately: Publications of the California State Division of Mines (to March 1, 1951), by Elisabeth L. Egenhoff, Beth Collins, and Mary-Louise Burgess, 117 pp.

(c) No. 3 (July), pp. 465-552, pl. 31, 3 figs.

Contains: Mineral needs and problems of the bituminous base roofing industry, by Dozier Finley, pp. 473-483; Mines and mineral resources of Fresno County, California, by C. A. Logan, Lewis T. Braun, and James W. Vernon, pp. 485-552, pl. 31, 3 figs.

The following, included with report, was also distributed separately: Map showing oil fields, mines, and mineral deposits of Fresno County, California, scale 1″ = 6 mi. (approx.)

(d) No. 4 (October), pp. 553-680, pls. 32-47, 9 figs.

Contains: Mines and mineral resources of Contra Costa County, by Fenelon F. Davis and James W. Vernon, pp. 561-617, pls. 32-42, 5 figs.; Fluorspar in California, by James W. Crosby III and Samuel R. Hoffman, pp. 619-638, pls. 43-47, 4 figs.; Index to volume 47, pp. 639-680.

The following, included with report, was also distributed separately: Map showing mines and mineral deposits of Contra Costa County, California, scale 1″ = 2 mi. (approx.)

California Journal of Mines and Geology, volume 48; Olaf P. Jenkins, Chief. 1952. 387 pp., 13 pls., 23 figs.

Issued also in separate parts as indicated below.

(a) No. 1 (January), pp. 1-134, pls. 1-5, 6 figs.

Contains: Mineral needs and problems of the lead-acid battery industry, by Dudley Haskell, pp. 9-27, 3 figs.; Mines and mineral resources of Glenn County, California, by J. C. O'Brien and L. T. Braun, pp. 29-53, pls. 1-5, 1 fig.; Annual report, Division of Mines, for the one hundred second fiscal year, July 1, 1950 to June 30, 1951, by Olaf P. Jenkins, pp. 55-99, 2 figs.; The mineral industry of California, its status and relation to national defense in 1950-51, by the staff of the Division of Mines, pp. 101-134.

The following, included with report, was also distributed separately: Map showing mines and mineral deposits of Glenn County, California, scale 1″ = 3 mi.

(b) No. 2 (April), pp. 135-179, pl. 6, 2 figs.; supplement, 189 pp., 268 illus.

Contains: Mines and mineral resources of Yuba County, by J. C. O'Brien, pp. 135-179, pl. 6, 2 figs.; Supplement, Fabricas, by Elisabeth L. Egenhoff, 189 pp., 268 illus.

The following, included with report, were also distributed separately: Map showing mines and prospects of Yuba County, California, scale 1″ = 2 mi. (approx.); Fabricas—A collection of contemporary pictures and statements on the mineral materials used in building in California prior to 1850, by Elisabeth L. Egenhoff, 189 pp, 268 illus. 1st printing, 1952, 2d printing, 1961.

(c) No. 3 (July), pp. 181-251, pls. 7-12, 11 figs.

Contains: California talc in the paint industry, by Richard S. Lamar, pp. 189-199, pls. 7-10, 1 fig.; Geology of the Starbright tungsten mine, San Bernardino County, California, by George C. Hazenbush, pp. 201-206, pl. 11, 3 figs.; Mines and mineral resources of Merced County, by Fenelon F. Davis and Denton W. Carlson, pp. 207-251, pl. 12, 7 figs.

The following, included with report, was also distributed separately: Geologic map of Merced County, California, showing mines, sand and gravel pits and holes drilled for oil, scale 1″ = 3 mi.

(d) No. 4 (October), pp. 253-387, pl. 13, 4 figs.

Contains: Mines and mineral resources of Del Norte County, California, by J. C. O'Brien, pp. 261-309, pl. 13, 4 figs.; Mineral commodities in California during 1950, by Henry H. Symons and Fenelon F. Davis, pp. 311-378; Index to volume 48, pp. 380-387.

The following, included with report, was also distributed separately: Map showing mines and mineral deposits of Del Norte County, scale 1″ = 3 mi. (approx.)

California Journal of Mines and Geology, volume 49; Olaf P. Jenkins, Chief. 1953. 418 pp., 10 pls., 82 figs.; supplement, 144 pp., illus.

Issued in separate parts as indicated below.

(a) Nos. 1 and 2 (January-April), pp. 1-259, and tabulated list pp. 1-192, 1-3, 48 figs. 1st printing, April 1953; 2d printing, May 1955.

Contains: Annual report of the State Mineralogist, Chief of the Division of Mines for the 103d fiscal year, July 1, 1951 to June 30, 1952, by Olaf J. Jenkins, pp. 9-48, figs. 1-2; Mines and mineral deposits of San Bernardino County, California, by Lauren A. Wright, Richard M. Stew-

art, Thomas E. Gay Jr., and George C. Hazenbush, pp. 49-259 and tabulated list pp. 1-192, pls. 1-3, 46 figs.

The following, included with report, was also distributed separately: Map of San Bernardino County, California, showing location of mines and mineral deposits, scale $1\frac{3}{4}$" = 12 mi.; 1st printing, April 1953; 2d printing, May 1955.

(b) No. 3 (July), pp. 261-337, pls. 4-9, 30 figs. 1st printing, July 1953; 2d printing, January 1954.

Contains: Flotative properties of titanium minerals in oleate solutions, by V. S. Pradhan and D. W. Mitchell, pp. 269-272, 2 figs.; Mines and mineral resources of Kings County, California, by Charles W. Jennings, pp. 273-296, pls. 4-9, 1 fig.; Adsorbent clays in California, by Richard S. Lamar, pp. 297-337, 27 figs.

The following, included with report, was also distributed separately: Geologic map of Kings County, California, showing mines and holes drilled for oil and gas, scale 1" = 3 mi.

(c) No. 4 (October), pp. 339-418, pl. 10, 4 figs.; supplement, 144 pp., illus.

Contains: Mines and mineral resources of Mendocino County, California, by J. C. O'Brien, pp. 347-398, pl. 10, 4 figs., including *Geology*, by Salem J. Rice, pp. 350-352; Index to volume 49, pp. 399-418; Supplement, De argento vivo, by Elisabeth L. Egenhoff, 144 pp., illus.

The following were also distributed separately: De argento vivo—historic documents on quicksilver and its recovery in California prior to 1860, by Elisabeth L. Egenhoff, 144 pp., illus. 1st printing, 1953, 2d printing, 1961; Mines and mineral resources of Mendocino County, California, by J. C. O'Brien, and Index to volume 49, pp. 347-418, pl. 10, 4 figs. (reprinted as separate January 1954); Map showing mines and mineral deposits of Mendocino County, north half and south half, scale $\frac{1}{2}$" = 1 mi.

California Journal of Mines and Geology, volume 50; Olaf P. Jenkins, Chief. 1954. 780 pp., 8 pls., 132 figs., shaded relief map.

Issued in separate parts as indicated below.

(a) No. 1 (January), pp. 1-285, pl. 1, 53 figs. 1st printing, January 1954; 2d printing, July 1954.

Contains: Annual report of the State Mineralogist, Chief of the Division of Mines, for the 104th fiscal year, July 1, 1952 to June 30, 1953, by Olaf P. Jenkins, pp. 9-58, 3 figs.; California mineral commodities in 1951, by Henry H. Symons and Fenelon F. Davis, pp. 59-147, 21 figs.; Mines and mineral resources of Amador County, California, by Denton W. Carlson and William B. Clark, pp. 149-285, pl. 1, 29 figs., 1st printing, 1954, 2d printing (separately) 1958.

The following, included with report, was also distributed separately: Geologic map of Amador County, California, showing mines and mineral deposits, scale $\frac{3}{8}$" = 1 mi. (approx.)

(b) No. 2 (April), pp. 287-430, pl. 2, 26 figs.

Contains: Nineteenth century mines and mineral spring resorts of Lake County, California, by Frederick J. Simoons, pp 295-319, 12 figs.; Mines and mineral resources of Santa Clara County, California, by Fenelon F. Davis and Charles W. Jennings, pp. 320-430, pl. 2, 14 figs., 1st printing, 1954, 2d printing (separately) 1958.

The following, included with report, was also distributed separately: Geologic map of Santa Clara County, California, showing mines and mineral deposits, scale $\frac{1}{2}$" = 1 mi.

(c) Nos. 3 and 4 (July-October), pp. 431-780, pls. 3-8, 52 figs., frontis., shaded relief map. 1st printing, 1954; 2d printing, 1955.

Contains: The Cool-Cave Valley limestone deposits, El Dorado and Placer Counties, California, by William B. Clark, pp. 439-465, pl. 3, 19 figs., frontis.; Mines and mineral deposits of Los Angeles County, California, by Thomas E. Gay Jr., and Samuel R. Hoffman, pp. 467-709, pls. 4-18, shaded relief map, 20 figs.; Annual report of the State Mineralogist, Chief of the Division of Mines, for the 105th fiscal year, July 1, 1953 to June 30, 1954, by Olaf P. Jenkins, pp. 711-768, 13 figs.; Index to volume 50, pp. 769-780.

The following, included with report, were also distributed separately: Geologic map of Los Angeles County, scale 1" = 6 mi.; Map of Los Angeles County showing mines, mineral product locations and oil field producing zones, scale ½" = 1 mi. (approx.); Shaded relief map of Los Angeles area, scale 1" = 8 mi., and Location map to accompany shaded relief map of the Los Angeles area, scale 1" = 8 mi.; Map of Angeles National Forest showing withdrawn and patented lands, scale 1" = 6 mi.

California Journal of Mines and Geology, volume 51; Olaf P. Jenkins, Chief. 1955. 465 pp., 5 pls., 95 figs.

Issued in separate parts as indicated below.

(a) No. 1 (January), pp. 1-95, pl. 1, 26 figs.

Contains: Mineral use in coated welding electrodes, by Richard M. Stewart, pp. 9-19, 6 figs.; Mines and mineral resources of San Joaquin County, California, by William B. Clark, pp. 21-95, pl. 1, 20 figs.

The following, included with report, was also distributed separately: Geologic map of San Joaquin County showing mines and mineral resources, scale 1" = 3 mi.

(b) No. 2 (April), pp. 97-199, pls. 2-3, 22 figs.

Contains: The processing of perlite, by H. A. Stein and J. B. Murdock, pp. 105-116, 10 figs.; Mines and mineral resources of Sacramento County, by Denton W. Carlson, pp. 117-199, pls. 2-3, 12 figs.

The following, included with report, was also distributed separately: Geologic map of Sacramento County showing location of mines, sand and gravel pits, gold dredges, natural gas fields, holes drilled for natural gas, and clay pits, scale 1" = 4 mi. (approx.)

(c) No. 3 (July), pp. 201-289, pl. 4, 28 figs.

Contains: Manganese deposits on the northeast Pacific sea floor, by Robert S. Dietz, pp. 209-220, 5 figs.; Mines, mineral resources, and mineral industries of Marin County, California, by William E. Ver Planck, pp. 221-289, pl. 4, 23 figs.

The following, included with report, was also distributed separately: Geologic map of Marin County, showing mines and mineral deposits.

(d) No. 4 (October), pp. 291-465, pl. 5, 19 figs.

Contains: California mineral commodities in 1952 and 1953, by Henry H. Symons and Fenelon F. Davis, pp. 299-400, 11 figs.; Mines and mineral resources of San Mateo County, California, by Fenelon F. Davis, pp. 401-458, pl. 5, 8 figs. 1st printing, 1955, 2d printing (separately) 1958; Index to volume 51, pp. 459-465.

The following, included with report, was also distributed separately: Geologic map of San Mateo County, California, showing locations of mineral product operations, scale 1" = 2 mi. (approx.)

California Journal of Mines and Geology, volume 52; Olaf P. Jenkins, Chief. 1956. 665 pp., 11 pls., 145 figs.

Issued in separate parts as indicated below.

(a) No. 1 (January), pp. 1-104, 38 figs.

Contains: Annual report of the State Mineralogist, Chief of the Division of Mines, for the 106th fiscal year, July 1, 1954 to June 30, 1955, by Olaf P. Jenkins, pp. 8-77, 22 figs. (including Report of the U. S. Geological Survey on cooperative studies of mineral deposits in California, fiscal year 1955, by Edgar H. Bailey, pp. 72-77); Sand and gravel for concrete aggregate, by Harold B. Goldman, pp. 79-104, 16 figs.

(b) No. 2 (April), pp. 105-227, pl. 1, 44 figs.

Contains: Basic studies in the clay industry: a series of papers presented at the Clay Industries Conference at the University of California in 1952, George B. Cleveland, editor, pp. 111-227, pl. 1, 44 figs. (including Introduction, by Joseph A. Pask, p. 112; Clays and clay mineralogy, by Joseph A. Pask, pp. 113-123, 3 figs.; Properties of clays, by W. J. Knapp, pp. 125-130, 5 figs.; Mineral exploration and winning of clays, by E. H. Wisser and Mort D. Turner, pp. 131-144; Clay testing, by W. O. Brandt, pp. 145-150; Testing of clays, by L. H. Lohman, pp. 151-154; Soluble salt deposits on clay wares, by Joseph A. Pask, pp. 155-165; Clay preparation and stiff-mud forming methods, by Clark Suther-

land, pp. 167-175; The drying of clay products, by R. K. Hursh, pp. 177-191, 12 figs.; The firing process, by R. K. Hursh, pp. 193-206, 7 figs.; Temperature measurement in kilns, by James L. Hall, pp. 207-217, 6 figs.; Pyrometry, by Ralph I. Brogie, pp. 219-227, 11 figs.)

(c) No. 3 (July), pp. 229-291, pls. 2-8, 23 figs.

Contains: Lode gold mines of the Alleghany-Downieville area, Sierra County, California, by Denton W. Carlson and William B. Clark, pp. 237-272, pls. 2-8, 19 figs.; History of borax production in the United States, by W. E. Ver Planck, pp. 273-291, 4 figs. 1st printing, 1956; 2d printing, 1961.

The following, included with report, was also distributed separately: Map showing mine locations of the Alleghany-Downieville area, scale 1¾" = 1 mi. (approx.)

(d) No. 4 (October), pp. 293-665, pls. 9-11, 40 figs.

Contains: Annual report of the State Mineralogist, Chief of the Division of Mines, for the 107th fiscal year, July 1, 1955 to June 30, 1956, by Olaf P. Jenkins, pp. 301-367, 9 figs. (includes Report of the U. S. Geological Survey on cooperative studies of mineral deposits in California, fiscal year 1956, by Paul C. Bateman, pp. 363-367); Mines and mineral resources of El Dorado County, California, by William B. Clark and Denton W. Carlson, pp. 369-591, pls. 9-11, 31 figs., 1st printing, 1956, 2d printing (separately), 1958; Recommendations for a national minerals policy, from the Western Governors Mining Advisory Council, November 9, 1955, at Sacramento, California, pp. 593-656; Index to volume 52, pp. 657-665.

The following, included with report, were also distributed separately: Economic, geologic map of El Dorado County, California, scale 1" = 4 mi.; Mines and mineral deposits of western El Dorado County showing mines and mineral deposits, scale 1" = 2 mi.

California Journal of Mines and Geology, volume 53; Olaf P. Jenkins, Chief. 1957. 758 pp., 1 map, 7 pls., 77 figs., frontispiece, 5 photos.

Issued in separate parts as indicated below.

(a) Nos. 1 and 2 (January-April), pp. 1-343, pls. 1-7, frontispiece, 75 figs. 1st printing, 1957. 2d printing, 1957.

Contains: Geology of the Island Mountain copper mine, Trinity County, California, by Melvin C. Stinson, pp. 9-33, pls. 1-3, 13 figs.; Mines and mineral deposits of Mariposa County, California, by Oliver E. Bowen Jr. and Cliffton H. Gray Jr., pp. 34-343, pls. 4-7, frontispiece, 62 figs.

The following, included with report, was also distributed separately: Map of Mariposa County, California, showing mines and prospects, 1957, scale 1" = 3 mi.

(b) Nos. 3 and 4 (July-October), pp. 345-758, 1 map, 2 figs., 5 photos.

Contains: Lead and zinc in California, by J. Grant Goodwin, pp. 353-724, 1 map, 2 figs., 5 photos; Index to volume 53, pp. 725-758.

The following, included with report, was also distributed separately: Outline geologic map of California showing locations of mines with lead and zinc production (Economic mineral map of California No. 7—Lead and zinc), 1957, by J. Grant Goodwin, scale 1:1,000,000.

California Journal of Mines and Geology, volume 54; Olaf P. Jenkins, Chief; Gordon B. Oakeshott, Chief. 1958. 602 pp., 5 pls., 123 illus.

Issued in separate parts as indicated below.

(a) No. 1 (January), pp. 1-205, 17 figs.

Contains: Annual report of the State Mineralogist, Chief of the Division of Mines for the 108th fiscal year, July 1, 1956 to June 30, 1957, by Olaf P. Jenkins, pp. 9-66, 6 figs. (including Report of the U.S. Geological Survey on cooperative studies of mineral deposits in California, by Paul C. Bateman, pp. 63-66); California mineral commodities in 1955 and 1954, by Henry H. Symons and Fenelon F. Davis, pp. 67-176, 11 figs.; Metal and mineral review for 1956 (U.S. Bureau of Mines), by Charles W. Merrill, pp. 177-205 (including Aluminum, by R. A. Heindl,

p. 177; Antimony, by Abbott Renick, p. 178; Arsenic, by Abbott Renick, p. 178; Asbestos, by D. O. Kennedy, p. 178; Barite, by A. E. Schreck, pp. 178-179; Bauxite, by R. C. Wilmot, p. 179; Beryllium, by Donald E. Eilertsen, pp. 179-180; Bismuth, by Abbott Renick; Boron, by Henry E. Stipp, p. 180; Cadmium, by Arnold M. Lansche, pp. 180-181; Cement, by D. O. Kennedy, p. 181; Chromium, by Wilmer McInnis, pp. 181-182; Cobalt, by Hubert W. Davis, p. 182; Columbium-tantalum, by William R. Barton, pp. 182-183; Copper, by A. D. McMahon, pp. 183-184; Diamond (industrial) and substitutes, by Henry P. Chandler, p. 184; Fluorspar, by Robert B. McDougal, pp. 184-185; Gold, by J. P. Ryan, p. 185; Graphite, by Donald R. Irving, p. 186; Gypsum, by Leonard P. Larson, p. 186; Iron ore, by Horace T. Reno, pp. 186-187; Kyanite, by Brook L. Gunsallus, p. 187; Lead, by O. M. Bishop, pp. 187-188; Lithium, by A. E. Schreck, p. 188; Magnesium, by H. B. Comstock, pp. 188-189; Manganese, by G. L. DeHuff Jr., pp. 189-190; Mercury, by James W. Pennington, p. 190; Mica, by Milford L. Skow, pp. 190-191; Molybdenum, by Wilmer McInnis, pp. 191-192; Nickel, by Hubert W. Davis, p. 192; Perlite, by L. M. Otis, p. 193; Phosphate rock, by E. Robert Ruhlman, p. 193; Platinum-group metals, by J. P. Ryan, pp. 193-194; Potash, by Robert Ruhlman, p. 194; Rare-earth metals, by Charles T. Baroch, pp. 194-195; Sand and gravel, by W. W. Key, p. 195; Selenium, by Elmo G. Knutson, pp. 195-196; Silver, by J. P. Ryan, pp. 196-197; Steel, by James C. O. Harris, pp. 197-198; Stone, by W. W. Key, pp. 198-199; Sulfur, by L. P. Larson, p. 199; Talc, soapstone, and pyrophyllite, by Donald R. Irving, pp. 199-200; Tin, by Abbott Renick, p. 200-201; Titanium, by Jesse A. Miller, pp. 201-202; Tungsten, by R. W. Holliday, p. 202; Uranium, by James Paone, p. 203; Vanadium, by Phillip M. Busch, p. 203; Zinc, by A. J. Martin, pp. 204-205; Zirconium and hafnium, by Glen C. Ware, p. 205).

(b) No. 2 (April), pp. 209-296, pls. 1-3, 46 figs.

Contains: Effect of mineral composition on strength of central-California sediments, by Robert B. Langston, Parker D. Trask, and Joseph A. Pask, pp. 215-235, 5 figs.; Sand and gravel resources of Cache Creek in Lake, Colusa, and Yolo Counties, California, by Ira E. Klein and Harold B. Goldman, pp. 237-296, pls. 1-3, 41 figs.

(c) No. 3 (July), pp. 299-492, pl. 4, 50 figs.

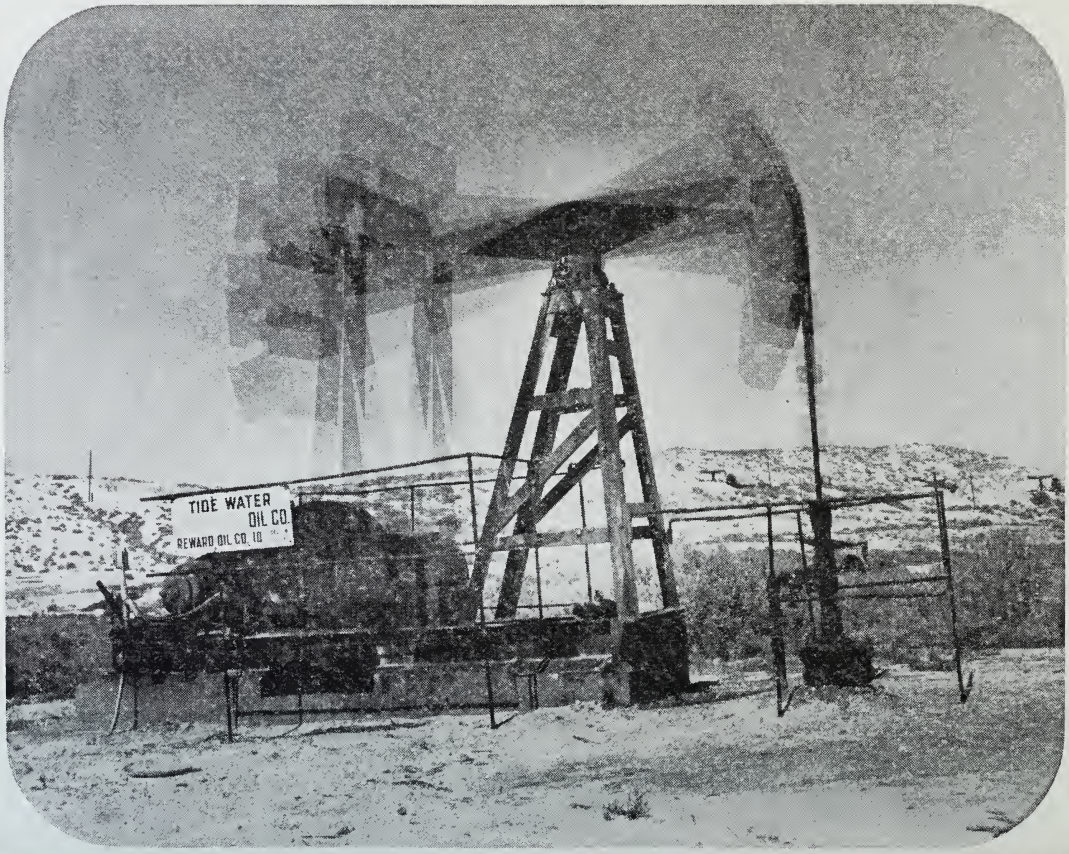
Contains: Poverty Hills diatomaceous earth deposit, Inyo County, California, by George B. Cleveland, pp. 305-316, 6 figs.; Mines and mineral resources of Tulare County, California, by J. Grant Goodwin, pp. 317-492, pl. 4, 44 figs.

The following, included with report was also distributed separately: Map of Tulare County, California, showing mines and prospects, 1958, scale 1" = 4 mi. (approx.)

(d) No. 4 (October), pp. 495-602, pl. 5, 6 figs., 4 photos.

Contains: Mines and mineral resources of Contra Costa County, California, by Fenelon F. Davis and Harold B. Goldman, pp. 501-583, pl. 5, 6 figs., 4 photos; Research in mining and the mineral industries in California—an interim report to the State Legislature prepared jointly by the University of California and the State Department of Natural Resources, pp. 585-594; Index to volume 54, pp. 595-602.

The following, included with report, was also distributed separately: Geologic map of Contra Costa County showing mines, quarries and gas wells, scale 1" = 3 mi.



A pumping well in the old Reward section of McKittrick oil field, Kern County. *Photo by Sarah Ann Davis.*

ANNUAL REPORTS OF THE STATE OIL AND GAS SUPERVISOR OF CALIFORNIA (AR)

In 1929 the California State Division of Mines and Mining was divided into a Division of Mines and a Division of Oil and Gas, both in the Department of Natural Resources. Beginning with the May 1929 issue, publication of the monthly *Summary of Operations* (which served as the annual report of the State Oil and Gas Supervisor) was taken over by the newly created Division of Oil and Gas.

First Annual Report of the State Oil and Gas Supervisor of California for the fiscal year 1915-16, covering operations of the Department of Petroleum and Gas of the State Mining Bureau [California State Mining Bureau Bulletin 73]; R. P. McLaughlin, Oil and Gas Supervisor. 1917. 278 pp., 27 figs., 47 township plats.

Chapter I: General statement and review of departmental work, by R. P. McLaughlin, pp. 5-59, figs. 1-14, 47 township plats. **Chapter II:** Coalinga, Lost Hills and Belridge fields, by M. J. Kirwan, pp. 60-115, figs. 15-19. **Chapter III:** Midway-Sunset, McKittrick and Kern River fields, by Chester Naramore, pp. 116-172, 4 tables. **Chapter IV:** Los Angeles, Orange and Ventura County oil fields, by Robert B. Moran, pp. 173-191. **Chapter V:** Report covering the oil fields of the Santa Maria district, by R. E. Collom, pp. 192-211, figs. 20-21. **Chapter VI, Special subjects:** Methods of shutting off water, by R. B. Moran, M. J. Kirwan, R. D. Bush and R. P. McLaughlin, pp. 212-222, fig. 21A; Collapsing strength of steel casing, pp. 222-224; Failure of derricks, by Chester Naramore, pp. 224-225; Gasoline plants in the Midway field, by Chester Naramore, pp. 225-227; The extraction of gasoline from natural gas by absorption, by Ben E. Lindsly, pp. 228-233, figs. 24-26; Federal action, pp. 233-235; Statistics of production, pp. 236-244, figs. 22-23; Directory of oil companies, pp. 245-271. **Appendix:** Publications of the California State Mining Bureau, pp. 272-274. **Index,** pp. 275-278.

Second Annual Report of the State Oil and Gas Supervisor of California for the fiscal year 1916-1917 covering operations of the Department of Petroleum and Gas of the State Mining Bureau [California State Mining Bureau Bulletin 82]; R. P. McLaughlin, Oil and Gas Supervisor. 1918. 412 pp., 30 figs., 56 township plat.

Chapter I: [No title], by R. P. McLaughlin, pp. 7-121, figs. 1-14, 16-19 56 township plat; includes Methods of shutting off water, by R. B. Moran, M. J. Kirwan, R. D. Bush, and R. P. McLaughlin, pp. 38-43; Methods and reasons for oil well shooting, by M. J. Kirwan, pp. 82-84; A method of removing casing and plugging wells used in the Kern River field, by G. McGregor, pp. 85-86; Method of mudding wells as practiced in the Kern River field, by G. McGregor, pp. 87-90; Financial statement, by W. W. Thayer, p. 92. **Chapter II:** Los Angeles, Orange, and Ventura Counties, by M. J. Kirwan, pp. 122-197, figs. 20-22. **Chapter III:** Santa Barbara and San Luis Obispo, Monterey, and Santa Clara Counties, by R. E. Collom, pp. 198-230. **Chapter IV:** Kern County, by R. N. Ferguson, pp. 231-322, figs. 23-24. **Chapter V:** Fresno County, by R. D. Bush, pp. 323-374, figs. 25-31. **Chapter VI:** Directory of oil operators, pp. 375-404. **Index,** pp. 405-412.

Third Annual Report of the State Oil and Gas Supervisor of California for the fiscal year 1917-1917 covering operations of the Department of Petroleum and Gas of the State Mining Bureau [California State Mining Bureau Bulletin 84]; R. P. McLaughlin, Oil and Gas Supervisor. 1918. 617 pp., 28 figs., 60 township plats.

Chapter I: [No title], by R. P. McLaughlin, pp. 7-109, figs. 1-6, 60 township plat; includes: Financial statement, by W. W. Thayer, pp. 23-24; Demonstrated value of mud fluid in protecting oil sands, by E. D. Nolan, pp. 77-79, fig. 3; Conclusions, by R. D. Bush, pp. 79-87, fig. 4; The use of mud fluid in abandonment, by R. D. Bush, pp. 87-90, fig. 5; mud fluid used by Standard Oil Company, by R. C. Stoner and C. C. Scharpenberg, pp 90-100; A process for reducing the viscosity of heavy oil, by E. A. Starke, pp. 107-109. **Chapter II:** Comparison of various methods of excluding water from oil wells in California, by R. E. Collom, pp. 110-197, figs. 7-8; includes: Progress chart for comparison of a group of drilling wells, by R. E. Collom, pp. 196-197, fig. 8. **Chapter III:** Los Angeles and Orange Counties, by M. J. Kirwan, pp. 198-313, figs. 9-13. **Chapter IV:** Ventura County, by Irving V. Augur, pp. 314-358. **Chapter V:** Santa Barbara, San Luis Obispo, Monterey and Santa Clara Counties, by H. W. Bell, pp. 359-409, fig. 14. **Chapter VI:** Kern, Tulare and Inyo Counties, by R. N. Ferguson, pp. 410-542, figs. 15-28. **Chapter VI [VII]:** Fresno, Kings and other counties, by R. D. Bush, pp. 543-572. **Chapter VIII:** Directory of oil operators, pp. 572-602. **Appendix:** Publications of the California State Mining Bureau, pp. 603-606. **Index,** pp. 607-617.

Fourth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. P. McLaughlin, Oil and Gas Supervisor. 1920.

Issued also in separate chapters, indicated below.

1. Summary of Operations, California Oil Fields, July 1918 to March 1919, inclusive, 205 pp.

2. Summary of Operations, California Oil Fields, April 1919, 29 pp., 2 illus. Contains: Purpose of publication, pp. 3-4; Model of Coyote Hills oilfield on exhibition at the Los Angeles office of the State Mining Bureau (photo), p. 5; [Summary of operations], pp. 6-28; Oil field maps, p. 29.

3. Summary of Operations, California Oil Fields, May 1919, 37 pp., 4 illus. Contains: Recent developments in the Elk Hills, Kern County (photo), p. 1; Preface, p. 3; Natural gas development in the Elk Hills, Kern County, California, by R. P. McLaughlin, pp. 4-11, 3 figs.; [Summary of operations], pp. 12-35; Mining Bureau publications, pp. 36-37.

4. Summary of Operations, California Oil Fields, June 1919, 35 pp., 1 photo. Contains: K.T. and O. well no. 8, 25-18-23, Midway, p. 1 (photo); Preface, p. 3; Methods of measuring and recording production of oil well, by R. P. McLaughlin, pp. 4-7; Perforating casing for the purpose of producing from or testing undeveloped formations, by Lawrence Vander Leck, pp. 7-9; [Summary of operations], pp. 10-33; Mining Bureau publications, pp. 34-35.

Fifth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. P. McLaughlin, Oil and Gas Supervisor. 1920.

Issued also in separate chapters, as indicated below.

Vol. 5, No. 1, Summary of Operations, California Oil Fields, July 1919, 46 pp., 6 pls. Contains: Preface, p. 3; Report on cause of damage by water to oil wells in sections 25 and 26, T. 31 S., R. 22 E., M.D.B. & M., Midway oil field, Kern County, California, by R. N. Ferguson, with an introduction by R. P. McLaughlin, pp. 5-21, pls. 1-6; [Summary of operations], pp. 22-44.

Vol. 5, No. 2, Summary of Operations, California Oil Fields, August 1919, 66 pp., 60 township plats. Contains: Preface, p. 3; Review of four years' work of the Department of Petroleum and Gas, by R. P. McLaughlin, pp. 5-9; Financial statement, by W. W. Thayer, pp. 10-12; Collection of funds by assessment, pp. 12-13; Proved oil land, pp. 13-43, 60 township plats; [Summary of operations], pp. 44-66.

Vol. 5, No. 3, Summary of Operations, California Oil Fields, September 1919, 80 pp., 9 plates. Contains: Preface, p. 3; Report on cause of damage by water in the southwestern portion of the Kern River oil field, Kern County, California, by R. N. Ferguson, pp. 5-52, 9 pls.; [Summary of operations], pp. 53-78.

Vol. 5, No. 4, Summary of operations, California Oil Fields, October 1919, 54 pp., 8 figs. Contains: Preface, p. 3; Comparison of efficiency in oil field operations, by R. P. McLaughlin, pp. 5-6; Encroachment of edge water in the oil sands of some California fields, by J. B. Case, pp. 6-21, figs. 1-8; [Summary of operations], pp. 22-54.

Vol. 5, No. 5, Summary of Operations, California Oil Fields, November 1919, 42 pp., 1 illus. Contains: Preface, p. 3; Measuring casing, by M. H. Soyster and John H. Dougherty, pp. 5-10; Sealing of formations in an oil well by mud fluid, by J. B. Case, pp. 11-12, 1 illus.; [Summary of operations], pp. 13-42.

Vol. 5, No. 6, Summary of Operations, California Oil Fields, December 1919, 72 pp., 5 pls. Contains: Preface, p. 3; Tulare Lake gas field, by R. P. McLaughlin, pp. 5-6; General statement relative to damage by water in the vicinity of Twenty-Five Hill, Midway oil field, Kern County, California, by R. P. McLaughlin, pp. 7-9; Report on cause of damage by water to oil wells in the vicinity of Twenty-Five Hill, Midway oil field, Kern County, California, by R. N. Ferguson, pp. 9-38, 5 pls.; [Summary of operations], pp. 39-70.

Vol. 5, No. 7, Summary of Operations, California Oil Fields, January 1920, 42 pp. Contains: Preface, p. 3; Perforating casing which serves to exclude water from an oil well, pp. 5-9; Possibilities of mud fluid in abandoning oil wells, by R. P. McLaughlin, p. 10; [Summary of operations], pp. 11-42.

Vol. 5, No. 8, Summary of Operations, California Oil Fields, February 1920, 78 pp., pls. 1, 5. Contains: Preface, p. 3; Policy to be followed by the State Oil and Gas Supervisor relative to the Ventura oil field, by R. P. McLaughlin, p. 5; Report on the Ventura oil field, Ventura County, California, by Lawrence Vander Leck, pp. 6-20, pls. 1, 5; Source of water in oil wells, by H. W. Bell, pp. 23-43; [Summary of operations], pp. 44-76.

Vol. 5, No. 9, Summary of Operations, California Oil Fields, March 1920, 48 pp., 4 pls., 2 figs. Contains: Preface, p. 3; Graphic methods of maintaining operating and cost statistics of oil wells, by W. M. Blodget and H. L. Briggs, pp. 5-9, pls. A-D; Application of aerial photography to topographic and geological mapping, by R. P. McLaughlin, p. 10, figs. 1-2; Successful repair of oil wells, by R. D. Bush, pp. 11-12; [Summary of operations], pp. 13-46; Mining Bureau publications, pp. 47-48.

Vol. 5, No. 10, Summary of Operations, California Oil Fields, April 1920, 71 pp., 6 illus. Contains: Preface, p. 3; Resumé of oil well operations in Imperial Valley, by Irving V. Augur, pp. 5-9, 1 photo, 1 map; Casmalia oil field, by H. W. Bell, pp. 10-40, 4 pls.; [Summary of operations], pp. 43-69; Mining Bureau publications, pp. 70-71.

Vol. 5, No. 11, Summary of Operations, California Oil Fields, May 1920, 56 pp., 10 pls. Contains: Preface, p. 3; Montebello oil field, by R. P. McLaughlin, pp. 5-6; Report on underground structure of the Montebello oil field, Los Angeles County, California, with particular reference to location of water-bearing formations, by Irving V. Augur, pp. 6-25, 10 pls.; [Summary of operations], pp. 28-54; Mining Bureau publications, pp. 55-56.

Vol. 5, No. 12, Summary of Operations, California Oil Fields, June 1920, 59 pp. Contains: Preface, p. 3; Increasing oil production by plugging and abandoning certain wells, by R. P. McLaughlin, pp. 5-6; Use of temporary water shut-off, by T. D. Kirwan, pp. 6-8; Oil and gas statistics for the year 1919, by Walter W. Bradley, pp. 9-25; [Summary of operations], pp. 26-57; Mining Bureau publications, pp. 58-59.

Sixth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. P. McLaughlin, R. E. Collom, Oil and Gas Supervisors. 1921.

Issued also in separate chapters, as indicated below.

Vol. 6, No. 1, July 1920, Summary of Operations, California Oil Fields, 44 pp., 9 illus. Contains: Preface, p. 3; Recementing through tubing under pressure, by C. C. Thoms, pp. 5-12, fig. 1; California oil supply, by R. P. McLaughlin, pp. 13-14, 8 production charts; [Summary of operations], pp. 15-42; Mining Bureau publications, pp. 43-44.

Vol. 6, No. 2, August 1920, Summary of Operations, California Oil Fields, 74 pp., 64 illus. Contains: Preface, p. 3; Circulating mud-laden fluid in connection with cable tool drilling, by M. Van Couvering, pp. 5-7, 1 illus.; Financial statement, by W. W. Thayer, pp. 8-9; [Expenditure and collection of funds], pp. 10-11; Proved oil land, pp. 12-43, 63 township plats; [Summary of operations], pp. 44-71; Mining Bureau publications, pp. 72-74.

Vol. 6, No. 3, September 1920, Summary of Operations, California Oil Fields, 39 pp. Contains: Preface, p. 3; Statistics showing production of oil and water by fields, pp. 4-10; [Summary of operations], pp. 11-36; Mining Bureau publications, pp. 37-39.

Vol. 6, No. 4, October 1920, Summary of Operations, California Oil Fields, 38 pp. Contains: Preface, p. 3; Control of California oil lands, by R. P. McLaughlin, pp. 5-8; [Summary of operations], pp. 9-35; Mining Bureau publications, pp. 36-38.

Vol. 6, No. 5, November 1920, Summary of Operations, California Oil Fields, 35 pp.

Vol. 6, No. 6, December 1920, Summary of Operations, California Oil Fields, 39 pp., 1 illus. Contains: Preface, p. 3; Wooden packer or plug for placing cement through tubing, by H. B. Thomson, pp. 4-5, 1 illus.; An occurrence of oil and gas at shallow depths in the Ventura Avenue field, by C. C. Thoms, pp. 6-8; [Summary of operations], pp. 9-36; Mining Bureau publications, pp. 37-39.

Vol. 6, No. 7, January 1921, Summary of Operations, California Oil Fields, 47 pp., 1 illus. Contains: Preface, p. 3; California petroleum in 1900 and 1920, by R. E. Collom, pp. 5-6; Spacing of oil wells and town-lot development, by R. E. Collom, pp. 7-11, 1 illus.; [Summary of operations], pp. 12-44; Mining Bureau publications, pp. 45-47.

Vol. 6, No. 8, February 1921, Summary of Operations, California Oil Fields, 40 pp., 2 pls. Contains: Preface, p. 3; Notes on a small oil recovery plant in Midway field, near Taft, California, by E. Huguenin, pp. 5-9, pls. 1-2; Production statistics of California oil fields, by R. E. Collom, pp. 10-11; [Summary of operations], pp. 12-38; Mining Bureau publications, pp. 39-40.

Vol. 6, No. 9, March 1921, Summary of Operations, California Oil Fields, 71 pp., pl. 1, figs. 3-4. Contains: Preface, p. 3; A method for the graphical interpretation of water analysis, by F. G. Tickell, pp. 7-12, figs. 3-4, pl. 1; Prospect wells, by R. E. Collom, pp. 13-18; Notices and reports, proposed or completed operations and tests, Department of Petroleum and Gas, pp. 19-27; [Summary of operations], pp. 28-68; Mining Bureau publications, pp. 69-71.

Vol. 6, No. 10, April 1921, Summary of Operations, California Oil Fields, 53 pp., 1 illus. Contains: Preface, p. 3; A method for introducing mud-laden fluid under high pressures into porous formations, by H. J. Steiny, pp. 4-5, 1 illus.; [Summary of operations], pp. 6-49; Index to special articles, "Summary of Operations—California Oil Fields" [vol. 4, April, to vol. 6, no. 9], p. 50; Mining Bureau publications, pp. 51-53.

Vol. 6, No. 11, May 1921, Summary of Operations, California Oil Fields, 61 pp., pls. 1-3, 5, figs. 3, 5. Contains: Preface, p. 3; Peg models—their construction and use: an engineering method of presenting graphically the data to be used in planning, development and remedial work on oil properties, by J. B. Case and H. B. Thompson, pp. 5-21,

pls. 1-3, 5, figs. 3, 5; [Summary of operations], pp. 22-57; Index to special articles, p. 58; Mining Bureau publications, pp. 59-61.

Vol. 6, No. 12, June 1921, Summary of Operations, California Oil Fields, 64 pp., 1 pl., 6 figs. Contains: Preface, p. 3; Notes on core drilling methods in oil fields, by R. E. Collom, pp. 3-15, 1 pl., 4 figs.; Notes on "core sampling" in connection with rotary drilling as practiced by Shell Company of California in the Coalinga oil field, by R. M. Barnes, pp. 16-20, 2 figs.; [Summary of operations], pp. 21-61; Index to special articles, p. 62; Mining Bureau publications, pp. 63-64.

Seventh Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. E. Collom, Oil and Gas Supervisor. 1922.

Issued also in separate chapters, as indicated below.

Vol. 7, No. 1, July 1921, Summary of Operations, California Oil Fields, 56 pp., 4 pls., 2 figs. Contains: Preface, p. 3; The Elk Hills oil field, by R. E. Collom, pp. 5-19, figs. 1-2, pls. 1-4; [Summary of operations], pp. 20-53; Index to special articles, p. 54; Mining Bureau publications, pp. 55-56.

Vol. 7, No. 2, August 1921, Summary of Operations, California Oil Fields, 153 pp., 69 township plats. Contains: Preface, p. 3; Proved oil land, by R. E. Collom, pp. 5-9; Production statistics of California oil fields, pp. 10-11; Collection of funds by assessment, p. 12; Financial statement, by W. W. Thayer, pp. 13-14; Township plats of proved oil land, pp. 15-49, 69 plats; Amendments to the law, p. 50; California laws for the conservation of petroleum and gas, 1921, pp. 51-67; [Summary of operations], pp. 68-99; Directory of California oil operators (revised to August 31, 1921), compiled by R. A. Wagener, pp. 100-150; Index to special articles, p. 151; Mining Bureau publications, pp. 152-153.

Vol. 7, No. 3, September 1921, Summary of Operations, California Oil Fields, 48 pp., 2 illus. Contains: Preface, p. 3; A successful method of introducing mud fluid into a flowing well, by H. B. Thomson, pp. 5-6, fig. 1; The oil and gas prospects in the vicinity of Buttonwillow, Kern County, California, by R. N. Ferguson, pp. 7-13, 1 illus.; [Summary of operations], pp. 14-45; Index to special articles, p. 46; Mining Bureau publications, pp. 47-48.

Vol. 7, No. 4, October 1921, Summary of Operations, California Oil Fields, 46 pp., 3 illus. Contains: Preface, p. 3; Oxy-acetylene welding applied to oil well casing, by P. S. Haury, pp. 5-11, 1 pl., 2 figs.; Notes on the effect of water invasion on the production of oil in the Kern River oil field, by J. B. Stevens, pp. 12-16, 1 illus.; [Summary of Operations], pp. 17-42; Index to special articles, pp. 43-44; Mining Bureau publications, pp. 45-46.

Vol. 7, No. 5, November 1921, Summary of Operations, California Oil Fields, 82 pp., 4 plus. Contains: Preface, p. 3; The Huntington Beach oil field, by R. E. Collom, pp. 5-43, pls. 1-4; [Summary of operations], pp. 44-78; Index to special articles, pp. 79-80; Mining Bureau publications, pp. 81-82.

Vol. 7, No. 6, December 1921, Summary of Operations, California Oil Fields, 54 pp., 1 fig. Contains: Preface, p. 3; Notes on the use of oil instead of water or mud fluid as a mixing fluid in drilling, by H. B. Thomson, pp. 5-12, fig. 1; A method for loosening frozen casing or drill pipe with oil, by W. W. Copp, pp. 13-15; [Summary of operations], pp. 16-50; Index to special articles, pp. 51-52; Mining Bureau publications, pp. 53-54.

Vol. 7, No. 7, January 1922, Summary of Operations, California Oil Fields, 48 pp., 2 pls. Contains: Preface, p. 3; Method used by Chanslor-Canfield Midway Oil Company in drilling oil wells in the North Midway oil field, California, by F. W. Ziegler, pp. 5-9, pls. 1-2; A method of lubricating drill collars to protect casing from wear, by W. W. Copp, pp. 10-11; [Summary of operations], pp. 12-44; Index to special articles, pp. 45-46; Mining Bureau publications, pp. 47-48.

Vol. 7, No. 8, February 1922, Summary of Operations, California Oil Fields, 85 pp., 3 pls. Contains: Preface, p. 3; Production statistics of California oil fields, pp. 5-7; Resume of operations in 1921, by R. E. Collom, pp. 8-12; Operations District No. 1, 1921, by M. H. Soyster, pp. 12-15; Operations District No. 2, 1921, by H. B. Thomson, pp. 15-16; Operations District No. 3, 1921, pp. 17-19; Operations District No. 4, 1921, by C. C. Thoms, pp. 19-35, pls. 1-2 (including Effects of the suspension of operations in Kern County fields during oilworkers' strike, pp. 21-28; Report on production conditions in Kern River field following resumption of operations after a shut-down of eight weeks in September and October, 1921, by E. Huguenin, pp. 28-35, pls. 1-2); Operations District No. 5, 1921, by R. M. Barnes, pp. 35-46, pl. 3 (including Report on production conditions in the Coalinga field during last half of 1921, by R. M. Barnes, pp. 36-46, pl. 3); [Summary of operations], pp. 47-81; Index to special articles, pp. 82-83; Mining Bureau publications, pp. 83-85.

Vol. 7, No. 9, March 1922, Summary of Operations, California Oil Fields, 62 pp., 2 pls., 4 figs. Contains: Preface, p. 3; Notes on the use of core barrel with rotary tools, by J. B. Case, pp. 5-7; Automatic bailer for oil recovery, by E. Huguenin, pp. 8-11, 4 figs.; Report on water condition in northwesterly part of Cat Canyon oil field, by F. D. Gore, pp. 12-17, pls. 1-2; [Summary of operations], pp. 18-58; Index to special articles, pp. 59-60; Mining Bureau publications, pp. 60-62.

Vol. 7, No. 10, April 1922, Summary of Operations, California Oil Fields, 67 pp., 4 pls. Contains: Preface, p. 3; Corrections, February, 1922, "Summary of Operations", p. 4; Notes on Long Beach oil field, Los Angeles County, by M. H. Soyster and M. Van Couvering, pp. 5-22, pls. 1-4; [Summary of operations], pp. 23-63; Index to special articles, pp. 64-65; Mining Bureau publications, pp. 65-67.

Vol. 7, No. 11, May 1922, Summary of Operations, California Oil Fields, 61 pp., 2 illus. Contains: Preface, p. 3; Production and consumption of California petroleum, by R. E. Collom; pp. 5-11, 1 fig.; A successful type of oil and gas separator, by H. B. Thomson, pp. 12-13, 1 fig.; [Summary of operations], pp. 14-57; Index to special articles, pp. 58-59; Mining Bureau publications, pp. 59-61.

Vol. 7, No. 12, June 1922, Summary of Operations, California Oil Fields, 53 pp., 4 pls., 2 figs. Contains: Preface, p. 3; Unusual engineering problems in the development of the South Mountain oil field, Ventura County, by Wendell M. Jones, pp. 5-9, figs. 1-2, pls. 1-5; [Summary of operations], pp. 10-49; Index to special articles, pp. 50-51; Mining Bureau publications, pp. 51-53.

Eighth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. E. Collom, Oil and Gas Supervisor. 1923.

Issued also in separate chapters, as indicated below.

Vol. 8, No. 1, July 1922, Summary of Operations, California Oil Fields, 75 pp., 6 pls. Contains: Preface, p. 3; Core drilling in oil fields of southern California, by J. E. Elliott and F. C. Merritt, pp. 5-12, pls. 1-5; A preliminary report on the Tulare Lake region, by R. M. Barnes, pp. 13-26, pl. 6; [Summary of operations], pp. 27-70; Index to special articles, pp. 71-72; Oil field maps, pp. 72-73; Mining Bureau publications, pp. 73-75.

Vol. 8, No. 2, August 1922, Summary of Operations, California Oil Fields, 101 pp., 1 pl., 2 figs., 69 township plats. Contains: Preface, p. 3; Gas conservation and development in Buena Vista Hills, by C. C. Thoms, pp. 5-14, fig. 1, pl. 1; California's proved oil and gas fields, by R. E. Collom, pp. 15-18, fig. 1; Production statistics of California oil fields, pp. 19-21; Collection of funds by assessment, p. 22; Financial statement, petroleum and gas fund, by W. W. Thayer, p. 23; Township plats of proved oil land, pp. 24-60, 69 plats; [Summary of operations], pp. 61-96; Index to special articles, pp. 97-98; Mining Bureau publications, pp. 99-101.

Vol. 8, No. 3, September 1922, Summary of Operations, California Oil Fields, 66 pp., 4 figs., 1 photo. Contains: Preface, p. 3; Notes on improved oil field tools, by W. W. Copp, pp. 5-17, 4 figs., 1 photo; [Summary of operations], pp. 18-61; Index to special articles, pp. 62-63; Oil field maps, p. 64; Mining Bureau publications, pp. 64-66.

Vol. 8, No. 4, October 1922, Summary of Operations, California Oil Fields, 70 pp., 5 figs. Contains: Preface, p. 3; Power equipment for drilling and producing oil wells, by H. A. Godde and W. L. Williams, pp. 5-19, 5 figs.; [Summary of operations], pp. 20-65; Index to special articles, pp. 66-67; Oil field maps, p. 68; Mining Bureau publications, pp. 68-70.

Vol. 8, No. 5, November 1922, Summary of Operations, California Oil Fields, 54 pp. Contains: Preface, p. 3; The determination of water in petroleum emulsions, by Harold V. Dodd, pp. 5-7; [Summary of operations], pp. 8-49; Index to special articles, pp. 50-51; Oil field maps, p. 52; Mining Bureau publications, pp. 52-54.

Vol. 8, No. 6, December 1922, Summary of Operations, California Oil Fields, 55 pp., 1 fig., 1 photo. Contains: Preface, p. 3; Corrections, p. 4; Method of handling heavy crude oil in the Casmalia oil field, by F. D. Gore, pp. 5-9, fig. 1, 1 photo; [Summary of operations], pp. 10-50; Index to special articles, pp. 51-52; Oil field maps, p. 53; Mining Bureau publications, pp. 54-55.

Vol. 8, No. 7, January 1923, Summary of Operations, California Oil Fields, 135 pp., 7 figs. Contains: Preface, p. 3; Mud fluid of rotary drilling, by R. E. Collom, pp. 5-25, figs. 1-2; The use of mud fluid to prevent water infiltration in oil and gas wells, by R. E. Collom, pp. 26-36; Report of committee [mudding], by Logan Burrell, E. G. Gaylord, E. W. Wagy, J. B. Case, R. M. Barnes, and B. E. Parsons, pp. 37-84, figs. 3-7; [Summary of operations], pp. 85-130; Index to special articles, pp. 131-132; Oil field maps, p. 133; Mining Bureau publications, pp. 134-135.

Vol. 8, No. 8, February 1923, Summary of Operations, California Oil Fields, 95 pp., 3 figs., 1 map. Contains: Preface, p. 3; Production statistics of California oil fields, pp. 5-7; Resume of oil field operations in California in 1922, by R. E. Collom, pp. 8-15, map; Operations District No. 1, 1922, by M. H. Soyster, pp. 16-21; Operations District No. 2, 1922, by H. B. Thomson, pp. 22-23; Operations District No. 3, 1922, by F. D. Gore, pp. 24-39, fig. 1; Operations District No. 4, 1922, by C. C. Thoms, pp. 40-47, fig. 2; Operations District No. 5, 1922, by R. M. Barnes, pp. 48-55, fig. 3; [Summary of operations], pp. 56-90; Index to special articles, pp. 91-92; Oil field maps, p. 93; Mining Bureau publications, pp. 94-95.

Vol. 8, No. 9, March 1923, Summary of Operations, California Oil Fields, 119 pp., 6 figs. Contains: Preface, p. 3; Natural gas production and utilization in southern California, by H. L. Masser, pp. 5-67, figs. 1-6; [Summary of operations], pp. 68-114; Index to special articles, pp. 115-116; Oil field maps, p. 117; Mining Bureau publications, pp. 118-119.

Vol. 8, No. 10, April 1923, Summary of Operations, California Oil Fields, 78 pp., 1 pl., 5 figs. Contains: Preface, p. 3; Completing an oil well and starting production, by W. W. Copp, pp. 5-18, pl. 1, figs. 1-5; [Summary of operations], pp. 19-73; Index to special articles, pp. 74-75; Oil field maps, p. 76; Mining Bureau publications, pp. 77-78.

Vol. 8, No. 11, May 1923, Summary of Operations, California Oil Fields, 77 pp., 4 pls., 4 figs. Contains: Preface, p. 3; Report on Santa Fe Springs oil field, by J. B. Case, pp. 5-19, pls. 1-4, figs. 1-4; [Summary of operations], pp. 20-72; Index to special articles, pp. 73-74; Oil field maps, p. 75; Mining Bureau publications, pp. 76-77.

Vol. 8, No. 12, June 1923, Summary of Operations, California Oil Fields, 60 pp. Contains: Preface, p. 3; Notes on use of resin for excluding water from oil wells, by R. M. Barnes, pp. 5-7; [Summary of operations], pp. 8-56; Index of special articles, pp. 57-58; Oil field maps, p. 59; Mining Bureau publications, pp. 59-60.

Ninth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. E. Collom, R. D. Bush, Oil and Gas Supervisors. 1924.

Issued also in separate chapters, as indicated below.

Vol. 9, No. 1, July 1923, Summary of Operations, California Oil Fields, 58 pp., 1 fig. Contains: Preface, p. 3; Recovering oil by perforating the water string, by H. A. Godde, pp. 5-9, fig. 1; [Summary of operations], pp. 10-54; Index of special articles, pp. 55-56; Oil field maps, p. 57; Mining Bureau publications, pp. 57-58.

Vol. 9, No. 2, August 1923, Summary of Operations, California Oil Fields, 121 pp., 2 pls., 76 township plats. Contains: Preface, p. 3; California oil production and reserves, by R. E. Collom and R. M. Barnes, pp. 5-23, pls. 1-2; Production statistics of California oil fields, pp. 25-29; Collection of funds by assessment and financial statement, pp. 30-32; Township plats of proved oil land, pp. 33-70, 76 township plats; [Summary of operations], pp. 71-117; Index of special articles, pp. 118-119; Oil field maps, p. 120; Mining Bureau publications, pp. 120-121.

Vol. 9, No. 3, September 1923, Summary of Operations, California Oil Fields, 56 pp. Contains: Preface, p. 3; Cooperative supervision of oil field operations, by R. E. Collom, pp. 5-7; [Summary of operations], pp. 8-52; Index of special articles, pp. 53-54; Oil field maps, p. 55; Mining Bureau publications, pp. 55-56.

Vol. 9, No. 4, October 1923, Summary of Operations, California Oil Fields, 72 pp., 5 pls. Contains: Preface, p. 3; Report on the Long Beach oil field, by J. B. Case and Robert L. Keyes, pp. 5-17, pls. 1-5; Summary of operations, pp. 18-67; Index of special articles, pp. 68-70; Oil field maps, p. 70; Mining Bureau publications, pp. 71-72.

Vol. 9, No. 5, November 1923, Summary of Operations, California Oil Fields, 86 pp., 8 pls. Contains: Preface, p. 3; Report on southeastern portion of Thirty-five Anticline, Sunset oil field, Kern County, California, by W. W. Copp and H. A. Godde, pp. 5-33; [Summary of operations], pp. 34-81; Index of special articles, pp. 82-84; Oil field maps, p. 84; Mining Bureau publications, pp. 85-86.

Vol. 9, No. 6, December 1923, Summary of Operations, California Oil Fields, 76 pp., 6 pls. Contains: Preface, p. 3; Report on Huntington Beach oil field, by J. B. Case and V. H. Wilhelm, pp. 5-16, pls. 1-5; Geochemical relationship of waters encountered in the Huntington Beach field, by M. A. Grizzle, pp. 17-28, pl. A; [Summary of operations], pp. 29-71; Index of special articles, pp. 72-74; Oil field maps, p. 74; Mining Bureau publications, pp. 75-76.

Vol. 9, No. 7, January 1924, Summary of Operations, California Oil Fields, 63 pp., 3 pls. Contains: Preface, p. 3; The use of fluids in cleaning oil wells, by Lew Suverkrop, pp. 5-14, pls. 1-3; [Summary of operations], pp. 15-58; Index of special articles, pp. 59-61; Oil field maps, p. 61; Mining Bureau publications, pp. 62-63.

Vol. 9, No. 8, February 1924, Summary of Operations, California Oil Fields, 104 pp., 6 figs. Contains: Preface, p. 3; Production statistics of California oil fields, pp. 5-9; Resume of oil field operations in California in 1923, by R. D. Bush, pp. 10-11; Operations in District No. 1, 1923, by C. C. Thoms, pp. 11-18, fig. 1; Operations in District No. 2, 1923, by E. Huguenin, pp. 19-22, fig. 2; Wildcat operations, District No. 3, 1923, by F. D. Gore, pp. 23-28, fig. 3; Operations in District No. 4, 1923, by W. W. Copp, pp. 29-33, fig. 4; Operations in District No. 5, 1923, by R. M. Barnes, pp. 35-47; figs. 5-6; [Summary of operations], pp. 48-100; Index of special articles, pp. 100-102; Oil field maps, p. 102; Mining Bureau publications, pp. 103-104.

Vol. 9, No. 9, March 1924, Summary of Operations, California Oil Fields, 62 pp. Contains: Preface, p. 3; Methods of determinating the fluid content of formations in open hole at Huntington Beach oil field, by V. H. Wilhelm, pp. 5-9; [Summary of operations], pp. 9-57; Index of special articles, pp. 58-60; Oil field maps, p. 60; Mining Bureau publications, pp. 60-62.

Vol. 9, No. 10, April 1924, Summary of Operations, California Oil Fields, 76 pp., 4 pls. Contains: Preface, p. 3; Mechanical control of oil wells flowing under high pressure, by A. J. Mason; pp. 5-14, pls. 1-4; [Summary of operations], pp. 15-71; Index of special articles, pp. 72-74; Oil field maps, p. 74; Mining Bureau publications, p. 75-76.

Vol. 9, No. 11, May 1924, Summary of Operations, California Oil Fields, 67 pp., 2 figs. Contains: Preface, p. 3; Determination of core samples in core drilling, by Albert C. Rubel, pp. 5-11, figs. 1-2; [Summary of operations], pp. 11-62; Index of special articles, pp. 63-65; Oil field maps, p. 66; Mining Bureau publications, pp. 66-67.

Vol. 9, No. 12, June 1924, Summary of Operations, California Oil Fields, 86 pp., 8 pls. Contains: Preface, p. 3; The minor oil fields of Kern County, Part 1, pp 5-29, pls. 1-8 (includes Introduction, by E. Huguenin, pp. 5-6; Devils Den field, by E. Huguenin, pp. 6-11, pl. 1; Hovey Hills field, by L. W. Saunders, pp. 11-18, pls. 2-3; Sunset Extension field, by R. G. Rogers, pp. 18-24, pls. 4-6; Wheeler Ridge field, by C. L. Kaiser, pp. 25-29, pls. 7-8); [Summary of operations], pp. 30-81; Index of special articles, pp. 82-84; Oil field maps, p. 85; Mining Bureau publications, pp. 85-86.

Tenth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. D. Bush, Oil and Gas Supervisor. 1925.

Issued also in separate chapters, as indicated below.

Vol. 10, No. 1, July 1924, Summary of Operations, California Oil Fields, 78 pp., 4 pls. Contains: Preface, p. 3; The minor oil fields of Kern County, Part 2, pp. 5-22, pls. 1-4 (includes Lost Hills oil field, by R. E. McCabe, pp. 5-10, pls. 1-2; Belridge and North Belridge oil fields, by H. Boezinger, pp. 11-18, pl. 3; Poso Creek field, by C. L. Kaiser, pp. 19-22, pl. 4); [Summary of operations], pp. 23-73; Index of special articles, pp. 74-76; Oil field maps, p. 77; Mining Bureau publications, pp. 77-78.

Vol. 10, No. 2, August 1924, Summary of Operations, California Oil Fields, 191 pp., 77 township plats. Contains: Preface, p. 3; Correction, p. 4; Production statistics of California oil fields, pp. 5-9; Collection of funds by assessment and financial statement, pp. 10-12; Township plats of proved oil land, pp. 13-51, 77 township plats; [Summary of operations], pp. 52-98; Directory of California oil operators (revised to August 31, 1924), compiled by R. A. Wagener, pp. 99-186; Index of special articles, pp. 187-189; Oil field maps, p. 190; Mining Bureau publications, pp. 190-191.

Vol. 10, No. 3, September 1924, Summary of Operations, California Oil Fields, 83 pp., 10 figs. Contains: Preface, p. 3; The study of subsurface formations in California oil field development, by G. D. Hanna and H. L. Driver, pp. 5-26, figs. 1-10; [Summary of operations], pp. 27-28; Index of special articles, pp. 79-81; Oil field maps, p. 82; Mining Bureau of publications, pp. 82-83.

Vol. 10, No. 4, October 1924, Summary of Operations, California Oil Fields, 61 pp., 2 pls. Contains: Preface, p. 3; Plunger rotators, by Lew Suverkrop, pp. 5-9, pls. 1-2; [Summary of operations], pp. 10-56; Index of special articles, pp. 57-59; Oil field maps, p. 60; Mining Bureau publications, pp. 60-61.

Vol. 10, No. 5, November 1924, Summary of Operations, California Oil Fields, 7 pp., 4 pls. Contains: Preface, p. 3; Oil fields of Ventura County, by H. A. Godde, p. 5-24, pls. 1-4; [Summary of operations], pp. 25-72; Index of special articles, pp. 73-75; Oil field maps, p. 76; Mining Bureau publications, pp. 76-77.

Vol. 10, No. 6, December 1924, Summary of Operations, California Oil Fields, 71 pp. Contains: Preface, p. 3; Rapid methods of water analysis, by F. G. Tickell, pp. 5-14; [Summary of operations], pp. 15-66; Index of special articles, pp. 67-69; Oil field maps, p. 70; Mining Bureau publications, pp. 70-71.

Vol. 10, No. 7, January 1925, Summary of Operations, California Oil Fields, 69 pp., 3 figs. Contains: Preface, p. 3; Correction, p. 4; Notes on the efficiency of flowing wells in the Dominguez field, California, by T. E. Swigart, pp. 5-17, figs. 1-3; [Summary of operations], pp. 18-64; Index of special articles, pp. 65-67; Oil field maps, p. 68; Mining Bureau publications, pp. 68-69.

Vol. 10, No. 8, February 1925, Summary of Operations, California Oil Fields, 94 pp., 4 figs. Contains: Preface, p. 3; Resume of oil field operations in California in 1924, by R. D. Bush, pp. 5-11; Operations in District No. 1, 1924, pp. 12-22, fig. 1; Operations in District No. 2, 1924, by H. A. Godde, pp. 23-25; Operations in District No. 3, 1924, by R. E. McCabe, pp. 26-31, fig. 2; Operations in District No. 4, 1924, by E. Huguenin, pp. 32-36, fig. 3; Operations in District No. 5, 1925, by V. H. Wilhelm, pp. 37-43, fig. 4; [Summary of operations], pp. 44-89; Index of special articles, pp. 90-92; Oil field maps, p. 93; Mining Bureau publications, pp. 93-94.

Vol. 10, No. 9, March 1925, Summary of Operations, California Oil Fields, 67 pp., 3 pls. Contains: Preface, p. 3; A recent development in drilling tools, by Lew Suverkrop, pp. 5-13, pls. 1-3; [Summary of operations], pp. 14-62; Index of special articles, pp. 63-65; Oil field maps, p. 66; Mining Bureau publications, pp. 66-67.

Vol. 10, No. 10, April 1925, Summary of Operations, California Oil Fields, 70 pp., 1 illus. Contains: Preface, p. 3; A long shoe used in the Kern River field, by R. G. Rogers, pp. 4-6, 1 illus.; [Summary of operations], pp. 7-65; Index of special articles, pp. 66-68; Oil field maps, p. 69; Mining Bureau publications, pp. 69-70.

Vol. 10, No. 11, May 1925, Summary of Operations, California Oil Fields, 70 pp., 3 pls. Contains: Preface, p. 3; Recent developments in the east end of the Elk Hills oil field, by L. W. Saunders, pp. 5-11, pls. 1-3; [Summary of operations], pp. 12-65; Index of special articles, pp. 66-68; Oil field maps, p. 69; Mining Bureau publications, pp. 69-70.

Vol. 10, No. 12, June 1925, Summary of Operations, California Oil Fields, 87 pp., 3 pls., 7 figs. Contains: Preface, p. 3; An electrical apparatus for locating the source of water in oil wells, by Robt. L. Keyes, pp. 5-18, pls. 1-3, figs. 1-7; [Summary of operations], pp. 19-82; Index of special articles, pp. 83-85; Oil field maps, p. 86; Mining Bureau publications, pp. 86-87.

Eleventh Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. D. Bush, Oil and Gas Supervisor. 1926.

Issued also in separate chapters, as indicated below.

Vol. 11, No. 1, July 1925, Summary of Operations, California Oil Fields, 91 pp., 3 pls. Contains: Preface, p. 3; Results of wildcat drilling in California 1914-1924, inclusive, by R. D. Bush, pp. 5-26, pls. 1-3; [Summary of operations], pp. 27-86; Index of special articles, pp. 87-89; Oil field maps, p. 90; Mining Bureau publications, pp. 90-91.

Vol. 11, No. 2, August 1925, Summary of Operations, California Oil Fields, 164 pp., 75 township plats. Contains: Preface, p. 3; Production statistics of California oil fields, p. 5-9; Collection of funds by assessment and financial statement, pp. 10-12; Township plats of proved oil land, pp. 13-52, 75 township plats; [Summary of operations], pp. 53-103; Directory of California oil operators (revised to August 31, 1925), by R. A. Wagener, pp. 104-159; Index of special articles, pp. 160-162; Oil field maps, p. 163; Mining Bureau publications, pp. 163-164.

Vol. 11, No. 3, September 1925, Summary of Operations, California Oil Fields, 81 pp., 5 pls. Contains: Preface, p. 3; Report on the Torrance oil field, by E. H. Musser, pp. 5-17, pls. 1-5; [Summary of operations], pp. 18-76; Index of special articles, pp. 77-79; Oil field maps, p. 80; Mining Bureau publications, pp. 80-81.

Vol. 11, No. 4, October 1925, Summary of Operations, California Oil Fields, 68 pp. Contains: Preface, p. 3; Use of quick setting cements in

oil wells, by C. C. Thoms, pp. 5-13; [Summary of operations], pp. 13-63; Index of special articles, pp. 64-66; Oil field maps, p. 67; Mining Bureau publications, pp. 67-68.

Vol. 11, No. 5, November 1925, Summary of Operations, California Oil Fields, 71 pp., 6 pls. Contains: Preface, p. 3; Correction, p. 4; The Rosecrans oil field, by E. H. Musser, pp. 5-21, pls. 1-6; [Summary of operations], pp. 22-66; Index of special articles, pp. 67-69; Oil field maps, p. 70; Mining Bureau publications, pp. 70-71.

Vol. 11, No. 6, December 1925, Summary of Operations, California Oil Fields, 83 pp., 5 pls. Contains: Preface, p. 3; Effect of closing in production in the Coalinga field, by V. H. Wilhelm, pp. 5-16, pls. 1-5; [Summary of operations], pp. 17-78; Index of special articles, pp. 79-81; Oil field maps, p. 82; Mining Bureau publications, pp. 82-83.

Vol. 11, No. 7, January 1926, Summary of Operations, California Oil Fields, 88 pp., 2 pls. Contains: Preface, p. 3; Methods of identifying subsurface strata for correlative purposes, by D. C. Roberts, pp. 5-26, pls. 1-2; [Summary of operations], pp. 27-83; Index of special articles, pp. 84-86; Oil field maps, p. 87; Mining Bureau publications, pp. 87-88.

Vol. 11, No. 8, February 1926, Summary of Operations, California Oil Fields, 109 pp., 4 figs. Contains: Preface, p. 3; Subject index, p. 4; Resume of oil field operations in California in 1925, by R. D. Bush, pp. 5-11; Operations in District No. 1, 1925, by E. Huguenin, pp. 12-21, fig. 1; Operations in District No. 2, 1925, by C. C. Thoms, pp. 22-25, fig. 2; Operations in District No. 3, 1925, by R. E. McCabe, pp. 26-30; Operations in District No. 4, 1925, by H. A. Godde, pp. 31-35, 37, fig. 3; Operations in District No. 5, 1925, by V. H. Wilhelm, pp. 36, 38-42; [Summary of operations], pp. 43-97; Summary of Operations—California Oil Fields [index of special articles], pp. 98-100; Index to Annual Reports of the State Oil and Gas Supervisor, pp. 101-107; Oil field maps, 108; Mining Bureau publications, pp. 108-109.

Vol. 11, No. 9, March 1926, Summary of Operations, California Oil Fields, 97 pp., 3 pls. Contains: Preface, p. 3; Conservation of natural gas, by R. D. Bush, pp. 5-7; Natural gas in California, by C. C. Brown, pp. 8-28, pls. 1-3; [Summary of operations], pp. 29-92; Summary of Operations, California Oil Fields, pp. 93-96; Oil field maps, p. 96; Mining Bureau publications, pp. 96-97.

Vol. 11, No. 10, April 1926, Summary of Operations, California Oil Fields, 66 pp., 2 pls. Contains: Preface, p. 3; Production and utilization of gas from Ventura field, by C. C. Thoms, pp. 5-10, pls. 1-2; [Summary of operations], pp. 11-61; Summary of Operations—California Oil Fields, pp. 62-64; Oil field maps, p. 65; Mining Bureau publications, pp. 65-66.

Vol. 11, No. 11, May 1926, Summary of Operations, California Oil Fields, 86 pp., 6 pls., 9 figs. Contains: Preface, p. 3; Improved pumping equipment for oil wells, pp. 5-22, 6 pls., 9 figs. (includes Part I—Long stroke equipment, by E. H. Musser, pp. 5-17, pls. 1-5, figs. 1-9; Part II—Circulating plunger pumps, by F. A. Graser, pp. 18-22, pl. 1); [Summary of operations], pp. 22-81; Summary of Operations—California Oil Fields, pp. 82-84; Oil field maps, p. 85; Mining Bureau publications, pp. 85-86.

Vol. 11, No. 12, June 1926, Summary of Operations, California Oil Fields, 86 pp., 7 pls. Contains: Preface, p. 3; Correction, p. 4; Inglewood oil field, by E. Hugenin, pp. 5-15, pls. 1-7; [Summary of operations], pp. 16-74; Index to Annual Reports of the State Oil and Gas Supervisor, pp. 75-81; Summary of Operations—California Oil Fields, pp. 82-84; Oil field maps, p. 85; Mining Bureau publications, pp. 85-86.

Twelfth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau; R. D. Bush, Oil and Gas Supervisor. 1927.

Issued also in separate chapters, as indicated below.

Vol. 12, No. 1, July 1926, Summary of Operations, California Oil Fields, 69 pp., 4 pls. Contains: Preface, p. 3; Report on the northeastern flank of the Buena Vista Hills, Midway oil field, Kern County,

California, by H. A. Godde and R. L. Keyes, pp. 5-12, pls. 1-4; [Summary of operations], pp. 13-64; Summary of Operations—California Oil Fields, pp. 65-67; Oil field maps, p. 68; Mining Bureau publications, pp. 68-69.

Vol. 12, No. 2, August 1926, Summary of Operations, California Oil Fields, 181 pp., 80 township plats, map. Contains: Preface, p. 3; Outline map of California showing location of oil fields and districts, p. 4; Production statistics of California oil fields, pp. 5-9; Collection of funds by assessment and financial statement, pp. 10-12; Township plats of proved oil land, pp. 13-52, 80 township plats; [Summary of operations], pp. 53-116; Directory of California oil operators (revised to August 31, 1926), compiled by R. A. Wagener, pp. 117-176; Summary of Operations—California Oil Fields, pp. 177-179; Oil field maps, p. 180; Mining Bureau publications, pp. 180-181.

Vol. 12, No. 3, September 1926, Summary of Operations, California Oil Fields, 76 pp., 3 figs., map. Contains: Preface, pp. 3-4, map: Use of heavy minerals in rotary drilling mud in the Ventura field, by C. C. Thoms, pp. 5-10, figs. 1-3; Reports issued by State Oil and Gas Supervisor during month of September, 1926, [Summary of operations], pp. 11-71; Summary of Operations—California Oil Fields, pp. 72-74; Oil field maps, p. 75; Mining Bureau publications, pp. 75-76.

Vol. 12, No. 4, October 1926, Summary of Operations, California Oil Fields, 83 pp., 9 pls., map. Contains: Preface, p. 3-4, map; Corrections, p. 5; Dominguez oil field, by Harold V. Dodd, pp. 7-20, 22, pls. 1-9; [Refinery statistics], pp. 21, 23-24; Reports issued by State Oil and Gas Supervisor during month of October, 1926, pp. 25-78; Summary of Operations—California Oil Fields, pp. 79-81; Oil field maps, p. 82; Mining Bureau publications, pp. 82-83.

Vol. 12, No. 5, November 1926, Summary of Operations, California Oil Fields, 75 pp., map. Contains: Preface, p. 3-4, map; Production losses into low pressure oil and gas sands, by R. D. Bush and V. H. Wilhelm, pp. 5-12; [Refinery statistics], pp. 13-15; Reports issued by State Oil and Gas Supervisor during month of November, 1926, pp. 16-70; Summary of Operations—California Oil Fields, pp. 71-73; Oil field maps, p. 74; Mining Bureau publications, pp. 74-75.

Vol. 12, No. 6, December 1926, Summary of Operations, California Oil Fields, 81 pp., 5 pls., map. Contains: Preface, pp. 3-4, map; The Richfield oil field, by E. H. Musser, pp. 5-18, pls. 1-5; [Refinery statistics], pp. 19-21; Reports issued by State Oil and Gas Supervisor during month of December, 1926, pp. 22-76; Summary of Operations—California Oil Fields, pp. 77-79; Oil field maps, p. 80; Mining Bureau publications, pp. 80-81.

Vol. 12, No. 7, January 1927, Summary of Operations, California Oil Fields, 79 pp., 2 pls., map. Contains: Preface, pp. 3-4, map; Report on the Mt. Poso oil field, by V. H. Wilhelm and L. W. Saunders, pp. 5-12, pls. 1-2; [Refinery statistics], pp. 13-16; [Reports issued by State Oil and Gas Supervisor during month of January 1927], pp. 17-74; Summary of Operations—California Oil Fields, pp. 75-77; Oil field maps, p. 78; Mining Bureau publications, pp. 78-79.

Vol. 12, No. 8, February 1927, Summary of Operations, California Oil Fields, 116 pp., 4 figs. Contains: Preface, pp. 3-4, map; Resume of oil field operations in California in 1926, by R. D. Bush, pp. 5-11; Operations in District No. 1, 1926, by E. Huguenin, pp. 13-23, fig. 1; Operations in District No. 2, 1926, by C. C. Thoms, pp. 24-27; Operations in District No. 3, 1926, by R. E. McCabe, pp. 28-32, fig. 2; Operations in District No. 4, 1926, by H. A. Godde, pp. 33-41, fig. 3; Operations in District No. 5, 1926, by R. L. Keyes, pp. 42-48, fig. 4; Wildcat wells abandoned in 1925 and 1926, by R. D. Bush, pp. 49-58; [Refinery statistics], pp. 59-61; Reports issued by State Oil and Gas Supervisor during month of February, 1927, pp. 62-110; Summary of Operations—California Oil Fields, pp. 111-114; Oil field maps, p. 115; Mining Bureau publications, pp. 115-116.

Vol. 12, No. 9, March 1927, Summary of Operations, California Oil Fields, 87 pp., map. Contains: Preface, p. 3-4, map; Conservation of gas in the production of oil, by R. D. Bush, pp. 5-9; [Refinery statistics], pp. 10-12; Reports issued by State Oil and Gas Supervisor during month of March, 1927, pp. 13-81; Summary of Operations—California Oil Fields, pp. 82-85; Oil field maps, p. 86; Mining Bureau publications, pp. 86-87.

Vol. 12, No. 10, April 1927, Summary of Operations, California Oil Fields, 77 pp., 4 pls., map. Contains: Corrections, p. 2; Preface, pp. 3-4, map; Fossil markers of Midway-Sunset-Elk Hills region in Kern County, California, by D. C. Roberts, pp. 5-10, pls. 1-4; [Refinery statistics], pp. 12-14; Reports issued by State Oil and Gas Supervisor during month of April, 1927, pp. 15-71; Summary of Operations—California Oil Fields, pp. 72-75; Oil field maps, p. 76; Mining Bureau publications, pp. 76-77.

Vol. 12, No. 11, May 1927, Summary of Operations, California Oil Fields, 76 pp., 4 pls., map. Contains: Preface, pp. 3-4, map; Development of the Maricopa shale production in the southeastern portion of Thirty-five anticline, Sunset oil field, Kern County, California, by H. A. Godde and E. H. Musser, pp. 5-17, pls. 1-4; [Refinery statistics], pp. 18-20; Reports issued by State Oil and Gas Supervisor during month of May, 1927, pp. 21-70; Summary of Operations—California Oil Fields, pp. 71-74; Oil field maps, p. 75; Mining Bureau publications, pp. 75-76.

Vol. 12, No. 12, June 1927, Summary of Operations, California Oil Fields, 82 pp., 8 pls., map. Contains: Preface, p. 3-4, map; Recent developments in the Huntington Beach oil field, by F. A. Graser, pp. 5-16, pls. 1-8; [Refinery statistics], pp. 17-19; Reports issued by State Oil and Gas Supervisor during month of June, 1927, pp. 20-69; Index to Annual Reports of State Oil and Gas Supervisor, pp. 70-76; Summary of Operations—California Oil Fields, pp. 77-80; Oil field maps, p. 81; Mining Bureau publications, pp. 81-82.

Thirteenth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau, California State Division of Mines and Mining; R. D. Bush, Oil and Gas Supervisor. 1928.

Issued also in separate chapters, as indicated below.

Vol. 13, No. 1, July 1927, Summary of Operations, California Oil Fields, 73 pp., 15 figs., map. Contains: Preface, pp. 3-4, map; Some improvements in fishing tools and devices used in rotary drilling, by Bernhard H. Scott, pp. 5-14, figs. 1-15; [Refinery statistics], pp. 15-17; Reports issued by State Oil and Gas Supervisor during month of July, 1927, pp. 18-67; Summary of Operations—California Oil Fields, pp. 68-71; Oil field maps, p. 72; Mining Bureau publications, pp. 72-73.

Vol. 13, No. 2, August 1927, Summary of Operations, California Oil Fields, 166 pp., 83 township plats, map. Contains: Preface, pp. 3-4, map; Production statistics of California oil fields, pp. 5-9; Collection of funds by assessment and financial statement, pp. 10-12; Township plats of proved oil land, pp. 13-54, 83 township plats; [Refinery statistics], pp. 55-57; Reports issued by State Oil and Gas Supervisor during month of August, 1927, pp. 58-110; Directory of California oil operators (Revised to August 31, 1927), by R. A. Wagener, pp. 111-160; Summary of Operations—California Oil Fields, pp. 161-164; Oil field maps, p. 165; Publications of Division of Mines and Mining, pp. 165-166.

Vol. 13, No. 3, September 1927, Summary of Operations, California Oil Fields, 73 pp., 8 pls., map. Contains: Preface, pp. 3-4, map; Seal Beach oil field, by W. W. Copp and Glenn H. Bowes, pp. 5-16, pls. 1-8; [Refinery statistics], pp. 17-19; Reports issued by State Oil and Gas Supervisor during month of September, 1927, pp. 20-67; Summary of Operations—California Oil Fields, pp. 68-71; Oil field maps, p. 72; Publications of Division of Mines and Mining, pp. 72-73.

Vol. 13, No. 4, October 1927, Summary of Operations, California Oil Fields, 69 pp., map. Contains: Preface, pp. 3-4, map; Loss of production due to improper completion method, by E. H. Musser, pp. 5-13; [Refinery statistics], pp. 14-16; Reports issued by State Oil and Gas Supervisor during month of October, 1927, pp. 17-63; Summary of Operations—California Oil Fields, pp. 64-67; Oil field maps, p. 68; Publications of Division of Mines and Mining, pp. 68-69.

Vol. 13, No. 5, November 1927, Summary of Operations, California Oil Fields, 83 pp., map, photo. Contains: Preface, pp. 3-4, map; Landing and cementing long water strings, by J. B. Case, pp. 5-17, 1 photo; [Refinery statistics], pp. 18-20; Reports issued by State Oil and Gas Supervisor during month of November, 1927, pp. 21-77; Summary of Operations—California Oil Fields, pp. 78-81; Oil field maps, p. 82; Publications of the Division of Mines and Mining, pp. 82-83.

Vol. 13, No. 6, December 1927, Summary of Operations, California Oil Fields, 78 pp., map. Contains: Preface, pp. 3-4, map; Production records and methods of measuring fluid, by H. A. Godde, pp. 5-10; [Refinery statistics], pp. 11-13; Reports issued by State Oil and Gas Supervisor during month of December, 1927, pp. 14-72; Summary of Operations—California Oil Fields, pp. 73-76; Oil field maps, p. 77; Publications of Division of Mines and Mining, pp. 77-78.

Vol. 13, No. 7, January 1928, Summary of Operations, California Oil Fields, 88 pp., 5 pls., map. Contains: Preface, pp. 3-4, map; Report on the Kern Front area of the Kern River oil field, by A. B. Hendrickson, pp. 5-18, pls. 1-5; [Refinery statistics], pp. 19-21; Reports issued by State Oil and Gas Supervisor during month of January, 1928, pp. 22-82; Summary of Operations—California Oil Fields, pp. 83-86; Oil field maps, p. 87; Publications of Division of Mines and Mining, pp. 87-88.

Vol. 13, No. 8, February 1928, Summary of Operations, California Oil Fields, 116 pp., 4 figs., map. Contains: Preface, pp. 3-4, map; Resume of oil field operations in California in 1927, by R. D. Bush, pp. 5-11; Operations in District No. 1, 1927, by E. Huguenin, pp. 12-20, fig. 1; Operations in District No. 2, 1927, by C. C. Thoms, pp. 21-25; Operations in District No. 3, 1927, by R. E. McCabe, pp. 26-31, fig. 2; Operations in District No. 4, 1927, by H. A. Godde, pp. 32-39, fig. 3; Operations in District No. 5, 1927, by R. L. Keyes, pp. 40-46, fig 4; Wildcat wells abandoned in 1927, by R. D. Bush, pp. 47-51; [Refinery statistics], pp. 52-54; Reports issued by State Oil and Gas Supervisor during month of February, 1928, pp. 55-110; Summary of Operations—California Oil Fields, pp. 111-114; Oil field maps, p. 115; Publications of the Division of Mines and Mining, pp. 115-116.

Vol. 13, No. 9, March 1928, Summary of Operations, California Oil Fields, 88 pp., 4 figs., map. Contains: Preface, pp. 3-4, map; How to increase oil recovery and conserve gas in the field, prepared by Subcommittee of California Operators General Committee on Gas Conservation, pp. 5-18, figs. 1-4; [Refinery statistics], pp. 19-21; Reports issued by State Oil and Gas Supervisor during month of March, 1928, pp. 22-82; Summary of Operations—California Oil Fields, pp. 83-86; Oil field maps, p. 87; Publication of Division of Mines and Mining, pp. 87-88.

Vol. 13, No. 10, April 1928, Summary of Operations, California Oil Fields, 79 pp., 4 charts, map. Contains: Preface, pp. 3-4, map; Variables of natural gas production and utilization in California, by A. F. Bridge, pp. 5-14, charts 1-4; [Refinery statistics], pp. 15-17; Reports issued by State Oil and Gas Supervisor during month of April, 1928, pp. 18-73; Summary of Operations—California Oil Fields, pp. 74-77; Oil field maps, p. 78; Publications of Division of Mines and Mining, pp. 78-79.

Vol. 13, No. 11, May 1928, Summary of Operations, California Oil Fields, 85 pp., 7 pls., map. Contains: Preface, pp. 3-4, map; Long Beach oil field, by D. C. Roberts, pp. 5-20, pls. 1-7; [Refinery statistics], pp. 21-23; Reports issued by State Oil and Gas Supervisor during month of May, 1928, pp. 24-79; Summary of Operations—California Oil Fields, pp. 80-83; Oil field maps, p. 84; Publications of Division of Mines and Mining, pp. 84-85.

Vol. 13, No. 12, June 1928, Summary of Operations, California Oil Fields, 96 pp., 7 pls., map. Contains: Preface, pp. 3-4, map; Tar sands in the Town-Lot area of Huntington Beach oil field, by S. G. Dolman, pp. 5-16, pls. 1-7; [Refinery statistics], pp. 17-19; Reports issued by State Oil and Gas Supervisor during month of June, 1928, pp. 20-81; Index to Annual Reports of State Oil and Gas Supervisor, pp. 83-90; Summary of Operations—California Oil Fields, pp. 91-94; Oil field maps, p. 95; Publications of Division of Mines and Mining, pp. 95-96.

Fourteenth Annual Report of the State Oil and Gas Supervisor, California State Division of Mines and Mining; R. D. Bush, Oil and Gas Supervisor. 1929.

Issued also in separate chapters as indicated below.

Vol. 14, No. 1, July 1928, Summary of Operations, California Oil Fields, 86 pp., 1 illus., map. Contains: Preface, pp. 3-4, map; Miocene formations in the east side fields of Kern County, by H. A. Godde, pp. 5-15, 1 illus.; [Refinery statistics], pp. 16-18; Reports issued by State Oil and Gas Supervisor during month of July, 1928, pp. 19-80; Summary of Operations—California Oil Fields, pp. 81-84; Oil field maps, p. 85; Publications of Division of Mines and Mining, pp. 85-86.

Vol. 14, No. 2, August 1928, Summary of Operations, California Oil Fields, 194 pp., 88 township plats, map. Contains: Preface, pp. 3-4, map; Production statistics of California oil fields, pp. 5-9; Collection of funds by assessment and financial statement, pp. 10-12; Township plats of proved oil land, pp. 13-56, 88 township plats; [Refinery statistics], pp. 57-59; Reports issued by State Oil and Gas Supervisor during month of August, 1928, pp. 60-128; Directory of California oil operators (revised to August 31, 1928), compiled by R. A. Wagener, pp. 129-188; Summary of Operations—California Oil Fields, pp. 189-192; Oil field maps, p. 193; Publications of Division of Mines and Mining, pp. 193-194.

Vol. 14, No. 3, September 1928, Summary of Operations, California Oil Fields, 98 pp., 1 fig., map. Contains: Preface, pp. 3-4, map; The use of hydraulic cement in oil wells, by J. B. Case, pp. 5-23, fig. 1; [Refinery statistics], pp. 24-26; Reports issued by State Oil and Gas Supervisor during month of September, 1928, pp. 27-92; Summary of Operations—California Oil Fields, pp. 93-96; Oil field maps, p. 97; Publications of Division of Mines and Mining, pp. 97-98.

Vol. 14, No. 4, October 1928, Summary of Operations, California Oil Fields, 101 pp., map. Contains: Preface, pp. 3-4, map; Some useful oil field tables, by E. H. Musser and Lew Suverkrop, pp. 5-24, 12 tables; [Refinery statistics], pp. 25-27; Reports issued by State Oil and Gas Supervisor during month of October, 1928, pp. 28-95; Summary of Operations—California Oil Fields, pp. 96-99; Oil field maps, p. 100; Publications of Division of Mines and Mining, pp. 100-101.

Vol. 14, No. 5, November 1928, Summary of Operations, California Oil Fields, 87 pp., 4 pls., map. Contains: Preface, pp. 3-4, map; Preliminary report on the Kettleman Hills oil field, by E. H. Musser, pp. 5-17, pls. A-D; [Refinery statistics], pp. 18-20; Reports issued by State Oil and Gas Supervisor during month of November, 1928, pp. 21-81; Summary of Operations—California Oil Field, pp. 82-85; Oil field maps, p. 86; Publications of Division of Mines and Mining, pp. 86-87.

Vol. 14, No. 6, December 1928, Summary of Operations, California Oil Fields, 103 pp., 2 pls., 2 figs., map. Contains: Preface, pp. 3-4, map; Measurement of gas production, by J. B. Case, pp. 5-32, pls. 1-2, figs. 1-2; [Refinery statistics], pp. 33-35; Reports issued by State Oil and Gas Supervisor during month of December, 1928, pp. 36-97; Summary of Operations—California Oil Fields, pp. 98-101; Oil field maps, p. 102; Publications of Division of Mines and Mining, pp. 102-103.

Vol. 14, No. 7, January 1929, Summary of Operations, California Oil Fields, 105 pp., 8 pls., map. Contains: Preface, pp. 3-4, map; Santa Fe Springs oil field, by A. B. Hendrickson and D. K. Weaver, pp. 5-21, pls. 1-8; [Refinery statistics], pp. 22-24; Reports issued by State Oil and

Gas Supervisor during month of January, 1929, pp. 25-99; Summary of Operations—California Oil Fields, pp. 100-103; Oil field maps, p. 104; Publications of Division of Mines and Mining, pp. 104-105.

Vol. 14, No. 8, February 1929, Summary of Operations, California Oil Fields, 129 pp., 4 figs., map. Contains: Preface, pp. 3-4, map. Correction, p. 5; Resume of oil operations in California in 1928, by R. D. Bush, pp. 7-13; Operations in District No. 1, 1928, by E. Huguenin, pp. 14-22, fig. 1; Operations in District No. 2, 1928, by C. C. Thoms, pp. 23-28; Operations in District No. 3, 1928, by R. E. McCabe, pp. 29-34, fig. 2; Operations in District No. 4, 1928, by H. A. Godde, pp. 35-42, fig. 3; Operations in District No. 5, 1928, by E. H. Musser, pp. 43-49, fig. 4; Wildcat wells abandoned in 1928, pp. 50-52; [Refinery statistics], pp. 53-55; Reports issued by State Oil and Gas Supervisor during month of February, 1929, pp. 56-122; Summary of Operations—California Oil Fields, pp. 123-126; Oil field maps, p. 127; Publications of Division of Mines and Mining, pp. 128-129.

Vol. 14, No. 9, March 1929, Summary of Operations, California Oil Fields, 103 pp., 3 pls., map. Contains: Preface, pp. 3-4, map; Uniform penetration in orderly development of oil zones, by C. C. Thoms, pp. 5-20, pls. 1-3; [Refinery statistics], pp. 21-23; Reports issued by State Oil and Gas Supervisor during month of March, 1929, pp. 24-96; Summary of Operations—California Oil Fields, pp. 97-100; Oil field maps, p. 101; Publications of Division of Mines and Mining, pp. 102-103.

Vol. 14, No. 10, April 1929, Summary of Operations, California Oil Fields, 115 pp., 8 figs., map. Contains: Preface, p. 3-4, map; A general discussion of natural gas technology, by Paul J. Howard, pp. 5-27, figs. 1-8; [Refinery statistics], pp. 28-30; Reports issued by State Oil and Gas Supervisor during month of April, 1929, pp. 31-108; Summary of Operations—California Oil Fields, pp. 109-113; Oil field maps, p. 113; Publications of Division of Mines and Mining, pp. 114-115.

BULLETINS (B)

1. A description of the desiccated human remains in the California State Mining Bureau, by Winslow Anderson. 1888. 41 pp., 6 illus.
2. Methods of mine-timbering, by W. H. Storms. 1896. 71 pp., 70 figs.
3. The gas and petroleum yielding formations of the central valley of California, by W. L. Watts. 1894. 100 pp., 16 illus.
4. Catalogue of California fossils, by J. G. Cooper. 1894. 65 pp., 6 pls.
5. The cyanide process, its practical application and economical results, by A. Scheidel. 1894. 140 pp., 27 illus.
6. California gold mill practices, by Ed B. Preston. 1895. 85 pp., 54 illus.
7. Mineral production of California, by counties, for the year 1894, by Charles G. Yale. 1895. Tabulated sheet.
8. Mineral production of California, by counties, for the year 1895, by Charles G. Yale. 1896. Tabulated sheet.
9. Mine drainage, pumps, etc., by Hans C. Behr. 1896. 210 pp., 206 figs.
10. A bibliography relating to the geology, paleontology, and mineral resources of California, by Anthony W. Vodges. 1896. 121 pp.
11. Oil and gas yielding formations of Los Angeles, Ventura, and Santa Barbara Counties, by W. L. Watts. 1897. 94 pp., 35 figs.
12. Mineral production of California, by counties, for 1896, by Charles G. Yale. 1897. Tabulated sheet.
13. Mineral production of California, by counties, for 1897, by Charles G. Yale. 1898. Tabulated sheet.
14. Mineral production of California, by counties, for 1898, by Charles G. Yale. 1899. Tabulated sheet.
15. Map of Oil City fields, Fresno County, by John H. Means. 1899.
16. The genesis of petroleum and asphaltum in California, by A. S. Cooper. 1899. 89 pp., 29 figs.
17. Mineral production of California, by counties, for 1899, by Charles G. Yale. 1900. Tabulated sheet.
18. Mother Lode region of California, by W. H. Storms. 1900. 154 pp., 49 illus.
19. Oil and gas yielding formations of California, by W. L. Watts. 1900. 236 pp., 74 illus.
20. Synopsis of general report of the California State Mining Bureau, by W. L. Watts. 1901. 21 pp.
21. Mineral production of California, by counties, by Charles G. Yale. 1900. Tabulated sheet.
22. Mineral production of California for fourteen years, by Charles G. Yale. 1900. Tabulated sheet.

23. The copper resources of California. 1902. [1905]. 282 pp., 77 illus.
    The following was included with bulletin: Map of California showing the approximate location of the principal copper deposits of the state. 1902.
24. The saline deposits of California, by Gilbert E. Bailey. 1902. 216 pp., 103 illus.
25. Mineral production of California, by counties, for 1901, by Charles G. Yale. 1902. Tabulated sheet.
26. Mineral production of California for the past fifteen years, by Charles G. Yale. 1902. Tabulated sheet.
27. The quicksilver resources of California, by William Forstner. 1903. 273 pp., 152 illus.
28. Mineral production of California for 1902, by Charles G. Yale. 1903. Tabulated sheet.
29. Mineral production of California for sixteen years, by Charles G. Yale. 1903. Tabulated sheet.
30. A bibliography relating to the geology, paleontology, and mineral resources of California, by Anthony W. Vodges. 1904. 290 pp., 6 illus.
31. Chemical analysis of California petroleum, by H. N. Cooper. 1904. Tabulated sheet.
32. Production and use of petroleum in California, by Paul W. Prutzman. 1904. 230 pp., 122 illus.
33. Mineral production of California, by counties, for 1903, by Charles G. Yale. 1904. Tabulated sheet.
34. Mineral production of California for seventeen years, by Charles G. Yale. 1904. Tabulated sheet.
35. Mines and minerals of California, by Charles G. Yale, 1904. 55 pp., 26 illus.
36. Gold dredging in California, by J. E. Doolittle. 1905. 120 pp., 69 illus.
37. Gems, jewelers' materials, and ornamental stones of California, by George F. Kunz. 1905. 171 pp., 51 illus. . . . 2d ed. 1905. 171 pp., 51 illus., color pls. 1, 2, 3, 5.
38. The structural and industrial materials of California. 1906. 412 pp., 150 illus.
39. Mineral production of California, by counties, for 1904, by Charles G. Yale. 1905. Tabulated sheet.
40. Mineral production of California for eighteen years, by Charles G. Yale. 1905. Tabulated sheet.
41. Mines and minerals of California for 1904, by Charles G. Yale. 1905. 54 pp., 26 illus.
42. Mineral production of California, by counties, for 1905, by Charles G. Yale. 1906. Tabulated sheet.
43. Mineral production of California for nineteen years, by Charles G. Yale. 1906. Tabulated sheet.
44. California mines and minerals, by Charles G. Yale. 1906. 54 pp., 26 illus.

45. Auriferous black sands of California, by J. A. Edman. 1907. 19 pp., 5 illus.
46. General index to publications of the California State Mining Bureau, by Charles G. Yale. 1907. 54 pp., 5 illus.
47. Mineral production of California, by counties, for 1906, by Charles G. Yale. 1907. Tabulated sheet.
48. Mineral production of California for twenty years, by Charles G. Yale. 1906. Tabulated sheet.
49. Mines and minerals of California for 1906, by Charles G. Yale. 1907. 34 pp.
50. The copper resources of California. 1908. 366 pp., 78 illus.

    The following is included with bulletin: Map of California showing the approximate location of the principal copper deposits of the state. 1908.
51. Mineral production of California, by counties, for 1907, by D. H. Walker. 1908. Tabulated sheet.
52. Mineral production of California for twenty-one years, by D. H. Walker. 1907. Tabulated sheet.
53. Mineral production of California, by Lewis E. Aubury. 1908. 84 pp., 23 illus.
54. Mineral production of California, by counties, by D. H. Walker. 1908. Tabulated sheet.
55. Mineral production of California for twenty-two years, by D. H. Walker. 1908. Tabulated sheet.
56. Mineral productions, county maps and mining laws of California, by Lewis E. Aubury. 1909. 99 pp., 23 illus.
57. Gold dredging in California, by Lewis E. Aubury, W. B. Winston, and Charles Janin. 1910. 305 pp., 249 illus.
58. Mineral production of California, by counties, by D. H. Walker. 1909. Tabulated sheet.
59. Mineral production of California for twenty-three years, by D. H. Walker. 1909. Tabulated sheet.
60. Mineral productions, county maps and mining laws of California, by Lewis E. Aubury. 1910. 115 pp., 23 illus.
61. Mineral production of California, by counties, for 1910, by D. H. Walker. 1911. Tabulated sheet.
62. Mineral production of California for twenty-four years, by D. H. Walker. 1910. Tabulated sheet.
63. Petroleum in southern California, by Paul W. Prutzman. 1913. 433 pp., 73 illus.
64. Mineral production for 1911, by E. S. Boalich. 1912. 49 pp.
65. Mineral production for 1912, by E. S. Boalich. 1913. 64 pp.
66. Mining laws, United States and California, by F. McN Hamilton. 1914. 89 pp.
67. Minerals of California, by Arthur S. Eakle. 1914. 226 pp.
68. Mineral production for 1913, by E. S. Boalich. 1914. 158 pp., 21 illus.

69. Petroleum industry of California, by R. P. McLaughlin. 1915. 519 pp., 109 illus., 18 pls. in accompanying folio.
70. Mineral production for 1914 with mining law appendix, by Fletcher Hamilton. 1915. 184 pp., 21 illus.
71. California mineral production for 1915 with mining law appendix and county maps, by Walter W. Bradley. 1916. 193 pp., 25 illus.
72. The geologic formations of California, with reconnaissance geologic map (scale 1″ = 12 mi.), by James Perrin Smith. 1916. 47 pp.
73. First annual report of the State Oil and Gas Supervisor of California for the fiscal year 1915-16, covering operations of the Department of Petroleum and Gas of the State Mining Bureau, by R. P. McLaughlin. 1917. 278 pp., illus. [See under Annual Reports of the State Oil and Gas Supervisor of California.]
74. California mineral production for 1916 with county maps, by Walter W. Bradley. 1917. 179 pp., 34 illus.
75. Mining laws, United States and California, compiled by Fletcher Hamilton. 1917. 115 pp.
76. Manganese and chromium in California, by Walter W. Bradley, Emile Huguenin, C. A. Logan, W. Burling Tucker, and Clarence A. Waring. 1918. 248 pp., 56 illus.
77. Catalogue of the publications of the California State Mining Bureau, 1880-1917, by E. S. Boalich. 1918. 44 pp.
78. Quicksilver resources of California, with a section on Metallurgy and ore-dressing, by Walter W. Bradley. 1918. 389 pp., 119 illus.
79. Magnesite in California, by Walter W. Bradley. 1925. 147 pp., 73 illus.
80. Not issued.
81. Not issued.
82. Second annual report of the State Oil and Gas Supervisor of California for the fiscal year 1916-1917 covering operations of the Department of Petroleum and Gas of the State Mining Bureau, by R. P. McLaughlin. 1918. 412 pp., illus. [See under Annual Reports of the State Oil and Gas Supervisor of California.]
83. California mineral production for 1917 with county maps, by Walter W. Bradley. 1918. 179 pp., 32 illus.
84. Third annual report of the State Oil and Gas Supervisor of California for the fiscal year 1917-1918 covering operations of the Department of Petroleum and Gas of the State Mining Bureau, by R. P. McLaughlin. 1918. 617 pp., illus. [See under Annual Reports of the State Oil and Gas Supervisor of California.]
85. Platinum and allied metals in California, by C. A. Logan. 1919. 120 pp., 14 illus.
86. California mineral production for 1918 with county maps, by Walter W. Bradley. 1919. 212 pp., 47 illus.

87. The commercial minerals of California, with notes on their uses, distribution, properties, ores, field tests, and preparation for market, by W. O. Castello. 1920. 124 pp.

88. California mineral production for 1919 with county maps, by Walter W. Bradley. 1920. 204 pp., 50 illus.

89. Petroleum resources of California with special reference to unproved areas, by Lawrence Vander Leck. 1921. 186 pp., 25 illus.

    Contains: Map of California showing generalized classification of land with regard to oil possibilities, scale 1½″ = 50 mi.

90. California mineral production for 1920 with county maps, by Walter W. Bradley. 1921. 218 pp., 46 illus.

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    Contains: Topographic map of Sierra Nevada gold belt showing distribution of the auriferous gravels, scale 1″ = 4 mi.

93. California mineral production for 1922, by Walter W. Bradley. 1923. 188 pp., 12 illus.

94. California mineral production for 1923, by Walter W. Bradley. 1924. 162 pp., 7 illus.

95. Geology and ore deposits of the Randsburg quadrangle, California, by Carlton D. Hulin. 1925. 152 pp., ix pp., 39 illus.

96. California mineral production for 1924, by Walter W. Bradley. 1925. 174 pp., 12 illus.

97. California mineral production for 1925, by Walter W. Bradley. 1926. 172 pp., 10 illus.

98. American mining law, with forms and precedents, by A. H. Ricketts. 3d ed. 1931. 811 pp., 20 illus.

99. The clay resources and the ceramic industry of California, by Waldemar Fenn Dietrich. 1928. 383 pp., 82 illus.

100. California mineral production for 1926, by Walter W. Bradley. 1927. 175 pp., 8 illus.

101. California mineral production for 1927, by Henry H. Symons. 1928. 311 pp., 6 illus.

102. California mineral production for 1928, by Henry H. Symons. 1929. 215 pp. 14 illus.

103. California mineral production for 1929, by Henry H. Symons. 1930. 231 pp., 11 illus.

104. Bibliography of the geology and mineral resources of California to December 31, 1930, by Solon Shedd. 1933. 376 pp., xi pp., 14 illus.

105. California mineral production and directory of mineral producers for 1930, by Henry H. Symons. 1931. 231 pp., 7 illus.

106. Manner of locating and holding mineral claims in California, by A. H. Ricketts. 1939. 26 pp.

107. California mineral production and directory of mineral producers for 1931, by Henry H. Symons. 1932. 229 pp., 10 illus.

108. Mother Lode gold belt of California, by Clarence A. Logan. 1935. 240 pp., 43 illus.

The following, included with bulletin, were also distributed separately: Geologic map of Mother Lode belt and vicinity, prepared by Olaf P. Jenkins, scale 1″ = 18 mi.; Map of Mother Lode gold belt in Amador County showing mining claims and areal geology, scale 1″ = 1 mi.; Map of Mother Lode gold belt in Calaveras County showing mining claims and areal geology, scale 1″ = 1 mi.; Map of Mother Lode gold belt in El Dorado County showing mining claims and areal geology, scale 1″ = 1 mi.; Map of Mother Lode gold belt in Mariposa County showing mining claims and areal geology, scale 1″ = 1 mi. Mother Lode gold belt in Tuolumne County, showing mining claims and areal geology, scale 1″ = 2 mi.

109. California mineral production and directory of mineral producers for 1932, by Henry H. Symons. 1933. 200 pp., 10 illus.

110. California mineral production and directory of mineral producers for 1933, by Henry H. Symons, 1934. 214 pp., 13 illus.

111. California mineral production and directory of mineral producers for 1934, by Henry H. Symons. 1935. 334 pp., 12 illus.

112. California mineral production and directory of mineral producers for 1935, by Henry H. Symons. 1937. 205 pp., 6 illus.

113. Minerals of California, by Adolf Pabst. 1938. 344 pp., xv pp., 1 illus.

114. California mineral production and directory of mineral producers for 1936, by Henry H. Symons, 1937. 199 pp., 5 illus.

115. Bibliography of the geology and mineral resources of California for the years 1931 to 1936, inclusive (supplementing the master bibliography, Bulletin 104), by Solon Shedd. 1937. 125 pp. xiv pp.

116. California mineral production and directory of mineral producers for 1937, by Henry H. Symons. 1938. 202 pp., 6 illus.

117. California mineral production and directory of mineral producers for 1938, by Henry H. Symons. 1939. 216 pp., 8 illus.

118. Geologic formations and economic development of the oil and gas fields of California, prepared under the direction of Olaf P. Jenkins. 1st printing, 1943. 2d printing, 1949. 773 pp., 6 pls., 1 map, 81 index maps, 296 figs.

Contains:

(a) **Part 1, Development of the industry, pp. 1-80, pl. 1, figs. 1-35, containing the following chapters:** *Chapter 1, Development and production, pp. 2-36, pl. 1, figs. 1-13. composed of Economics of the oil and gas* industry of California, by J. R. Pemberton, pp. 3-14, figs. 1-2; Taxation and its relation to development and production, by Granville S. Borden, pp. 15-16; Historical production chart, by H. L. Scarborough, pp. 16-17, pl. 1; Stocks, shipments, and production charts, by H. L. Scarborough, pp. 17-19, figs. 3-4b; Significant statistics, by Wm. R. Wardner Jr., pp. 20-25; Analysis of California petroleum reserves and their relation to demand and curtailment, by Wm. R. Wardner Jr., pp. 26-32, figs. 5-11; Natural gas fields of California, by Roy M. Bauer and John F. Dodge, pp. 33-36, figs. 12-13. *Chapter 2, Exploration, pp. 37-72, figs. 13A-33E, composed of* Outline map of portion of California showing location of oil fields and districts, by R. D. Bush, p. 38, fig. 13A; Development of engineering technique and its effect upon exploration for oil and gas in California, by Lester C. Uren, pp. 39-62, figs. 14-27B; Mechanics of California reservoirs, by Stanley C. Herold, pp. 63-66, figs. 28-31; Geophysical studies in California, by F. E. Vaughan, pp. 67-70, fig. 32; Geochemical prospecting for petroleum, by E. E. Rosaire, pp. 71-72, figs. 33A-E. *Chapter 3, Early History, pp. 73-80, figs. 33F-35, composed of* Aboriginal use of bitumen by

the California Indians, by Robert F. Heizer, p. 74, fig. 34; History of exploration and development of gas and oil in northern California, by Walter Stalder, pp. 75-80, fig. 35.

(b) Part 2, Geology of California and the occurrence of oil and gas, pp. 81-276, pls. 2-6, figs. 36-115, containing the following chapters: *Chapter 4, Introduction to the geology, pp. 92-97, 1 map, figs. 36-45, composed of* Geomorphic provinces of California, by Olaf P. Jenkins, pp. 83-88, figs. 36-38; California relief map, 1930, showing geomorphic provinces, by H. A. Sedelmeyer, p. 84, fig. 36; Salient geologic events in California and their relationship to mineral deposition, by Olaf P. Jenkins, pp. 89-94, figs. 39-43; Position of the California oil fields as related to geologic structure, by Ralph D. Reed, pp. 95-97, figs. 44-45. *Chapter 5, Geologic history and structure, pp. 98-163, pl. 2, figs. 46-59B composed of* California's record in the geologic history of the world, by Ralph D. Reed, pp. 99-118, figs. 46-55; Geologic history and structure of the central Coast Ranges of California, by N. L. Taliaferro, pp. 119-163, figs. 56-59B, pl. 2. *Chapter 6, Paleontology and stratigraphy, pp. 164-207, pls. 3-4, figs. 60-87B composed of* Characteristic fossils of California, by G. Dallas Hanna and Leo George Hertlein, pp 165-182, figs. 60-67; Descriptions of foraminifera, by C. C. Church, p. 182; Synopsis of the later Mesozoic in California, by Frank M. Anderson, pp. 183-186, figs. 68-71; Notes on Tertiary correlation, by Bruce L. Clark, pp. 187-191, fig. 72; Index to township and range system of California, p. 192, fig. 73; Eocene formaminiferal correlations in California, by Boris Laiming, pp. 193-198, figs. 74-83; Sequence of Oligocene formations of California, by Lesh C. Forrest, pp. 199-200, pl. 3, fig. 84; Correlation chart of the Miocene of California, by Robert M. Kleinpell, p. 200, pl. 4; Pliocene correlation chart, by U. S. Grant IV and Leo George Hertlein, pp. 201-202, fig. 85; The Pleistocene in California, by J. E. Eaton, pp. 203-207, figs. 86-87B. *Chapter 7, Occurrence of oil, pp. 208-276, pls. 5-6, figs. 88-115 composed of* Stratigraphic formations of the producing zones of the Los Angeles Basin oil fields, by Stanley G. Wissler, pp. 209-234, figs. 88-94, pl. 5; Correlation of the oil fields of the Santa Maria district, by Stanley G. Wissler and Frank E. Dreyer, pp. 235-238, fig. 95; Correlation of oil field formations on east side San Joaquin Valley, by Glenn C. Ferguson, pp. 239-246, figs. 96A-98; Correlation of oil field formations on west side of San Joaquin Valley, by Paul P. Goudkoff, pp. 247-252, figs. 99A-101; Origin, migration and accumulation of oil in California, by Harold W. Hoots, pp. 253-276, pl. 6, figs. 102-115.

The following is included with bulletin: Index map of the economic minerals in California (showing also geomorphic provinces) scale 1" = 80 mi.

(c) Part 3, Descriptions of individual oil and gas fields, pp. 277-664, 81 index maps, figs. 116, 282, containing Citations to selected references, by Elisabeth L. Egenhoff, pp. 278 et. seq. throughout Part 3, Index maps 101-122, 201-217, 301-307, 401-432, 501-503. *Chapter 8, Los Angeles Basin and southernmost California, pp. 281-369, figs. 116-152 composed of* Los Angeles City oil field, by E. K. Soper, p. 282-283, fig. 116; Salt Lake oil field, by E. K. Soper, pp. 284-286, fig. 117; Beverly Hills oil field, by E. K. Soper, p. 287, fig. 118; Whittier oil field, by W. H. Holman, pp. 288-291, figs. 119-121; Playa del Rey oil field, by Loyde H. Metzner, pp. 292-294, fig. 123; El Segundo oil field, by Richard G. Reese, pp. 295-296, fig. 124; Lawndale oil field, by Richard G. Reese, p. 297; Torrance oil field, by Eugene L. Davis, pp. 298-300, fig. 125; Wilmington oil field, by Read Winterburn, pp. 301-305, figs. 126-127; Inglewood oil field, by Herschel L. Driver, pp. 306-309, fig. 128; Potrero oil field, by Robin Willis and Richard S. Ballantyne Jr., pp. 310-317, figs. 129-131; Dominguez oil field, by S. Grinsfelder, pp. 318-319, fig. 132; Long Beach oil field, by Harry P. Stolz, pp. 320-324, figs. 133-134; Seal Beach oil field, by Glenn H. Bowes, pp. 325-328, figs. 135-137; Huntington Beach oil field, by D. K. Weaver and V. H. Wilhelm, pp. 329-331, fig. 138; Newport oil field, by Frank S. Parker, pp. 332-334, fig. 139; West Montebello area of the Montebello oil field, by Harry P. Stolz and A. F. Woodward, pp. 335-339, fig. 140; Montebello area of the Montebello oil field, by Richard G. Reese, pp. 340-342, fig. 141; Santa Fe Springs oil field, by H. E. Winter, pp. 343-346, fig. 142; West Coyote area of the Coyote Hills oil field, by Richard G. Reese, pp.

347-348; East Coyote area of the Coyote Hills oil field, by Paul H. Dudley, pp. 349-354, figs. 143-146; Yorba Linda area of the Coyote Hills oil field, by Frank S. Parker, pp. 355-356, fig. 147; Richfield area of the Richfield oil field, by Chester M. Gardiner, pp. 357-360, figs. 148-149; Kraemer area of the Richfield oil field, by Richard G. Reese, p. 361; Chino area, by Max L. Krueger, pp. 362-363, fig. 150; Cretaceous formations of the northern Santa Ana Mountains, by W. P. Popenoe, pp. 364-366, fig. 151; Southwestern San Diego County, by Leo George Hertlein and U. S. Grant IV, pp. 367-369, fig. 151. *Chapter 9, Ventura Basin and Transverse Ranges, pp. 370-424, figs. 153-176, composed of* Gaviota-Concepcion area, by William W. Porter II, pp. 372-373; Capitan oil field, by George R. Kribbs, pp. 374-376, figs. 153-154; Goleta oil field, by Frederick P. Vickery, pp. 377-379, fig. 155; Elwood oil field, by Mason L. Hill, pp. 380-383, figs. 156-157; La Goleta gas field, by R. O. Swayze, pp. 384-385, fig. 158; Summerland oil field, by Emil Kluth, p. 386; Rincon oil field, by R. E. Stewart, pp. 387-389, fig. 159; Ventura Avenue oil field, by C. C. Thoms and Wm. C. Bailey, pp. 391-393, fig. 160; Santa Paula oil field, by Louis N. Waterfall, p. 394, fig. 161; Sespe oil field, by Thomas Clements, pp. 395-399, fig. 162; Piru oil field, by H. D. Hobson, pp. 400-403, figs. 163-165; South Mountain oil field, by Loring B. Snedden, pp. 404-405, fig. 166; Bardsdale area of the Bardsdale oil field, by Loring B. Snedden, p. 406; Shiells Canyon area of the Bardsdale oil field, by Loring B. Snedden, p. 407; Del Valle oil field, by R. W. Sherman, pp. 408-411, figs. 167-169; Newhall oil field, by W. S. W. Kew, pp. 412-416, figs. 170-171; Simi oil field, by T. F. Stipp, pp. 417-423, figs. 172-176; Conejo oil field, by John C. May, p. 424. *Chapter 10, Santa Maria Basin and southern Coast Ranges, pp. 425-481, figs. 177-202 composed of* Lompoc oil field, by T. W. Dibblee Jr., pp. 427-429, fig. 177; Casmalia oil field, by William W. Porter II, p. 430; Santa Maria (Orcutt) oil field, by F. E. Dreyer, p. 431; West Cat Canyon area of the Cat Canyon oil field, by Charles Manlove, pp. 432-434, fig. 178; East Cat Canyon area of the Cat Canyon oil field, by Rodman K. Cross, pp. 435-437, figs. 179-180; Gato Ridge area of the Cat Canyon oil field, by Rodman K. Cross, pp. 438-439, fig. 181; Santa Maria Valley oil field, by Charles R. Canfield, pp. 440-442, figs. 182-183; Geology of Huasna area, by N. L. Taliaferro, pp. 443-447, figs. 184-185; Huasna area development, by Vernon L. King, pp. 448-449; Arroyo Grande (Edna) oil field, by Max L. Krueger, pp. 450-452, fig. 186; Caliente Range, Cuyama Valley, and Carrizo Plain, by J. E. Eaton, pp. 453-455, figs. 187-188; Bradley-San Miguel district, by N. L. Taliaferro, pp. 456-462, fig. 189; Type locality of the Vaqueros formation, by Richard R. Thorup, pp. 463-466, figs. 190-192; Soledad quadrangle, by L. F. Schombel, pp. 467-470, figs. 193-195; Cantua-Vallecitos area, by E. R. Atwill, pp. 471-474, figs. 196-199; Sargent oil field, by James Michelin, pp. 475-476, fig. 200; Moody Gulch oil field, by Max L. Krueger, p. 477, fig. 201; Halfmoon Bay district, by Richard R. Crandall, pp. 478-480, fig. 202; Mount Diablo region, by Charles M. Cross, p. 481. *Chapter 11, San Joaquin Valley and bordering foothills, pp. 482-583, figs. 203-258, composed of* Geologic horizons of oil and gas fields of San Joaquin Valley and farther north, by Paul J. Howard, p. 483, fig. 203; Coalinga oil field, by Max Birkhauser, pp. 484-485, fig. 204; Coalinga East Extension area of the Coalinga oil field, by L. S. Chambers, pp. 486-490, figs. 205-207; Kettleman Hills oil fields, by John Galloway, pp. 491-493, fig. 208; Lost Hills oil field, by G. S. Follansbee Jr., pp. 494-495, figs. 209-210; Devils Den oil field, by Martin Van Couvering and H. B. Allen, pp. 496-501, figs. 211-213; Belridge oil field, by J. B. Wharton, pp. 502-504; Temblor oil field, by R. R. Simonson, pp. 505-506, fig. 214; McKittrick Front and Cymric areas of the McKittrick oil field, by E. R. Atwill, pp. 507-509, figs. 215-216; McKittrick area of the McKittrick oil field, by John B. Stevens, pp. 510-511, fig. 217; Elk Hills oil field (U. S. Naval Petroleum Reserve No. 1), by Lawrence E. Porter, pp. 512-516, figs. 218-220; Buena Vista Hills area of the Midway-Sunset oil field, by J. H. McMasters, pp. 517-518, fig. 221; North Midway area of the Midway Sunset oil field, by W. T. Woodward, pp. 519-521, figs. 222-223; Republic area of the Midway-Sunset oil field, by Umberto Young, pp. 522-525, fig. 224; Williams and Twenty-five Hill areas of the Midway-Sunset oil field, by Donuil Hillis and W. T. Woodward, pp. 526-529, figs. 225-228; Gibson area of the

Midway-Sunset oil field, by W. T. Woodward, pp. 530-531, figs. 229-230; Wheeler Ridge oil field, by S. H. Gester, pp. 532-533, fig. 231; Type locality of the Tejon formation, by Jay Glenn Marks, pp. 534-538, figs. 232-233; Dudley Ridge gas field, by Gerard Henny, pp. 539-540, fig. 234; Semitropic gas field, by W. W. Valentine, p. 542, fig. 235; Buttonwillow gas field, by L. S. Chambers, pp. 543-545, figs. 236-237; Canal oil field, by R. N. Williams Jr., pp. 546-547, fig. 238; Strand oil field, by Charles M. Cross, p. 548, fig. 239; Ten Section oil field, by A. W. Gentry, pp. 549-550, fig. 240; Trico gas field, by E. C. Doell, pp. 551-552, figs. 241-242; Wasco oil field, by Roy M. Barnes, pp. 553-555, fig. 243; Rio Bravo oil field, by Earl B. Noble, pp. 556-558, fig. 244; Greeley oil field, by W. P. Winham, pp. 559-561, figs. 245-246; Fruitvale oil field, by Robert H. Miller and Glen W. Ledingham, pp. 562-564, fig. 247; Mountain View oil field, by Robert H. Miller and Glenn C. Ferguson, pp. 565-570, fig. 248; Kern Front area of the Kern River oil field, by Everett C. Edwards, pp. 571-574, figs. 249-252; Kern River area of the Kern River oil field, by John B. Stevens, p. 575, fig. 253; Edison oil field, by Everett C. Edwards, pp. 576-578, figs. 254-255; Round Mountain oil field, by R. G. Rogers, pp. 579-583, figs. 256-258; *Chapter 12, Northern San Joaquin Valley, Sacramento Valley, and northern Coast Ranges, pp. 584-635, figs. 259-282, composed of* Tracy gas field, by H. T. Beckwith, pp. 586-587, fig. 259; McDonald Island gas field, by George L. Knox, pp. 588-590, fig. 260; Rio Vista gas field, by E. K. Soper, pp. 591-594, fig. 261; Potrero Hills gas field, by Frank B. Tolman, pp. 595-598, figs. 262-263; Fairfield Knolls gas field, by J. M. Kirby, pp. 599-600, fig. 264; Rumsey Hills area, by J. M. Kirby, pp. 601-605, figs. 265-266; Sites region, by J. M. Kirby, pp. 606-608, figs. 267-268; Willows gas field, by R. N. Williams Jr., p. 609, fig. 269; Marysville Buttes (Sutter Buttes) gas field, by Harry R. Johnson, pp. 610-615, figs. 270-271; Berryessa Valley, by F. M. Anderson, pp. 616-618, fig. 272; Paskenta region, by Robert L. Rist and William C. Harrington, pp. 619-620, figs. 273-274; Duxbury Point region, by James M. Douglas, p. 621, fig. 275; Petaluma region, by F. A. Johnson, pp. 622-627, figs. 276-279; Point Arena-Fort Ross region, by Charles E. Weaver, pp. 628-632, fig. 280; Central and southern Humboldt County, by Harry D. MacGinitie, pp. 633-635, figs. 281-282. *Chapter 13, Tabulated data on wells drilled outside of the principal oil and gas fields, pp. 636-664.*

(d) Part 4, Glossaries, bibliography, and index, pp. 665-773, figs. 283-284, containing the following chapters: *Chapter 14, Glossary of the geologic units of California, compilation based largely on the work of M. Grace Wilmarth and Alice S. Allen, abstracted and revised by Olaf P. Jenkins, pp. 666-687, figs. 283-284. Chapter 15, Bibliography, pp. 688-720,* List of publications cited throughout Bulletin 118, by Elizabeth L. Egenhoff, pp. 689-720. *Chapter 16, Index to Bulletin 118, by Elizabeth L. Egenhoff, pp. 722-773.*

The following is included with report: Outline geologic map of California showing oil and gas fields and drilled areas (Economic mineral map of California no. 2—Oil and gas), scale 1:1,000,000, by Olaf P. Jenkins, 1st ed., 1941, 2d ed., 1952 (see SR 23). 3d ed., 1955 (see SR 45).

119. California mineral production and directory of mineral producers for 1939, by Henry H. Symons. 1941. 223 pp., 8 illus.

120. Manner of locating and holding mineral claims in California, by A. H. Ricketts (with revisions by C. McK Laizure, August 1941). 1941. 26 pp.

121. California mineral production and directory of mineral producers for 1940, by Henry H. Symons. 1941. 227 pp., 12 illus.

122. California mineral production and directory of mineral producers for 1941, by Henry H. Symons. 1942. 377 pp., 8 figs.

123. American mining law, with forms and precedents, by A. H. Ricketts. 1st ed. (contained in Rept. 11, pp. 521-574), 1893; 2d ed. (a series of four articles in Rept. 20, pp. 105-148, 208-

304, 381-415, and Rept. 21, pp. 77-121), 1924 and 1925; 3d ed. (Bull. 98), 1931; 4th ed., 1st printing (Bull. 123), pp. i-xxxi, 1-1018, I-XVI, 1943; 4th ed., 2d printing, vol. 1, pp. i-xxxi, 1-618; vol. 2, pp. 619-1018, 1948.

124. Commercial minerals of California, by George L. Gary. 1942. 166 pp., mimeographed.

125. Manganese in California, prepared under the direction of Olaf P. Jenkins. 1943. 387 pp., 1 map, 46 figs.

Contains: Preface, by Olaf P. Jenkins, pp. 9-12; History of the manganese industry, by Robert Scott Kroger, pp. 13-21; Occurrence and minerals of manganese, by Theo H. Crook, pp. 23-40; Utilization of California manganese ores, by O. Cutler Shepard, pp. 41-49, 2 figs.; Manganese deposits of California, a summary report, by Parker D. Trask, Ivan F. Wilson, and Frank S. Simons, pp. 51-215, 2 figs.; Genesis of the manganese deposits of the Coast Ranges of California, by N. L. Taliaferro and F. S. Hudson, pp. 217-275, 22 figs.; Manganese deposits of the Sierra Nevada, their genesis and metamorphism, by N. L. Taliaferro, pp. 277-332, 20 figs.

The following, included with bulletin, was also distributed separately: Outline geologic map of California showing locations of manganese properties (Economic mineral map No. 5—Manganese), by Olaf P. Jenkins, scale 1:1,000,000.

126. California mineral production and directory of mineral producers for 1942, by Henry H. Symons. 1943. 224 pp., 7 illus.

127. Manner of locating and holding mineral claims in California, by A. H. Ricketts (with revisions by C. A. Logan, March 1944). 1944. 35 pp.

128. California mineral production and directory of mineral producers for 1943, by Henry H. Symons. 1944. 222 pp., 10 illus.

129. Iron resources of California, prepared under the direction of Olaf P. Jenkins. 1948. 304 pp., 25 pls., 68 figs.

Contains: Preface, by Olaf P. Jenkins, pp. ix-xii; Parts A-P, see below; Bibliography of the iron-ore resources of California, by Elizabeth L. Egenhoff, pp. 269-300; Index, pp. 302-304.

Issued also in separate parts, as indicated below.

(a) Iron-ore deposits in the eastern part of the Eagle Mountains, Riverside County, California, by Jarvis B. Hadley, pp. 1-24, pls. 1-3, figs. 1-11.

(b) Iron Mountain iron-ore deposits, Lava Bed district, San Bernardino County, California, by Carl A. Lamey, pp. 25-38, pl. 4, figs. 12-15.

(c) Iron Mountain and Iron King iron-ore deposits, Silver Lake district, San Bernardino County, California, by Carl A. Lamey, pp. 39-58, pls. 5-7, figs. 16-19.

(d) Old Dad Mountain iron-ore deposit, San Bernardino County, California, by Carl A. Lamey, pp. 59-68, figs. 20-22.

(e) Cave Canyon iron-ore deposits, San Bernardino County, California, by Carl A. Lamey, pp. 69-84, pl. 8, figs. 23-29.

(f) Vulcan iron-ore deposit, San Bernardino County, California, by Carl A. Lamey, pp. 85-96, pl. 9, figs. 30-33.

(g) Iron Hat (Ironclad) iron-ore deposits, San Bernardino County, California, by Carl A. Lamey, pp. 97-109, pl. 10, figs. 34-37.

(h) Ship Mountains iron-ore deposit, San Bernardino County, California, by Carl A. Lamey, pp. 110-116, pls. 11-12, fig. 38.

(i) Minarets magnetite deposits of Iron Mountain, Madera County, California, by Parker D. Trask and Frank S. Simons, pp. 117-128, pl. 13, figs. 39-43.

(j) Hirz Mountain iron-ore deposits, Shasta County, California, by Carl A. Lamey, pp. 129-136, pls. 14-16, fig. 44.

(k) Shasta and California iron-ore deposits, Shasta County, California, by Carl A. Lamey, pp. 137-164, pls. 17-19, figs. 45-53.

(*l*) Iron-ore deposits near Lake Hawley and Spencer Lakes, Sierra County, California, by Cordell Durrell and Paul D. Proctor, pp. 165-192, pls. 20-23, figs. 54-57.

(m) Iron deposits of the Kingston Range, San Bernardino County, California, by D. F. Hewett, pp. 193-206, pl. 24, fig. 58.

(n) Summary of the iron-ore situation in California, by Ernest F. Burchard, pp. 207-230, figs. 59-64.

(o) Summary of investigations of iron-ore deposits of California, by A. C. Johnson and Spangler Ricker, pp. 231-242.

(p) Titaniferous iron-ore deposits of the western San Gabriel Mountains, Los Angeles County, California, by Gordon B. Oakeshott, pp. 243-266, pl. 25, figs. 65-68.

130. Economic mineral resources and production of California; A survey with reference to postwar employment, by Samuel H. Dolbear. 1945. 219 pp., pp. A1-56, B1-146, C1-23, Index pp. 1-14, 3 maps.

Contains: Preface, by Samuel H. Dolbear, pp. 7-8; Summary, pp. 9-10; Place and function of minerals in the state's economy, pp. 11-25; California mineral reserves, pp. 26-30, 1 map; Employment in California mineral industries, by S. R. Coghlan, pp. 31-41; Legislative and other control in mineral industry, pp. 42-43; Needed changes in California statutory and administrative law, by Robert M. Searls, pp. 44-46; Needed changes in federal statutory and administrative law, by Philip R. Bradley, Jr., pp. 47-54; Possible expansion of California mineral industries, pp. 55-59; The chemical industry as consumer of California minerals, by Herbert Waterman, pp. 60-70; Postwar construction and new equipment projects, pp. 70-71; National mineral policy, pp. 72-73. Commercial minerals of California, pp. 74-219, includes: Aluminum, pp. 75-76; Antimony, p. 76; Asbestos, pp. 77-78; Barite, pp. 78-80; Bentonite and fullers earth, pp. 80-82; Bituminous rock, pp. 82-83; Borates, pp. 83-86; Bromine, pp. 86-87; Building stone, pp. 87-89; Calcium chloride, p. 90; Calcium silicate, p. 90; Carbon dioxide gas, p. 91; Cement, pp. 92-97; Chromite, pp. 97-100; Clay and clay products, by J. Clark Sutherland, pp. 100-106; Coal, p. 107; Copper, lead, and zinc, by Hadley R. Bramel, pp. 107-118; Diatomite, pp. 118-120; Feldspar, pp. 120-121; Garnet (abrasive), pp. 121-122; Gold, by G. A. Joslin, pp. 122-151; Gypsum, pp. 151-155; Iodine, p. 155; Iron and steel, by H. Foster Bain, pp. 155-165; Lime, limestone, and dolomite, by Roy E. Tremoureux, pp. 165-169; Lithium, pp. 169-171; Magnesite and magnesium compounds, by S. R. Coghlan, pp. 171-174; Magnesium, pp. 175-176; Manganese, pp. 176-179; Mineral water, p. 180; Minor minerals, pp. 181-182; Molybdenum, pp. 182-183; Platinum, p. 184; Potash, pp. 184-186; Pumice, pp. 187-189; Pyrites, pp. 189-190; Quicksilver, pp. 191-196; Salt, by Walter W. Bradley, pp. 196-199; Semi-precious stones and crystals, p. 199; Silica, pp. 199-201; Sillimanite group, pp. 202-204; Soda ash-salt cake, pp. 204-207; Stone, miscellaneous, pp. 207-210; Strontium, p. 210; Sulphur, pp. 210-211; Talc and steatite, by J. Clark Sutherland, pp. 211-215; Tungsten, pp. 215-219. Appendix A: Directory of producers, pp. A1-56; Appendix B: Mineral production by counties, pp. B1-146; Appendix C, pp. C1-23 includes Public Resources Code, pp. C1-4; and Publications of the Division of Mines, pp. C5-23. Index, pp. 1-14.

The following are included with bulletin: Map of California showing progress in topographic quadrangles and geologic maps, scale 1″ = 40 mi. (approx.); and Map of California showing distribution of mineral deposits, scale 1″ = 40 mi. (approx.); prepared by Olaf P. Jenkins. Commercial minerals of California (chart).

131. Consolidated index of publications, Division of Mines and State Mining Bureau, 1880-1943, by Walter W. Bradley, 1945. 872 pp., i-xxi.

132. California mineral production and directory of mineral producers for 1944, by Henry H. Symons. 1945. 224 pp., 6 illus.

133. Geology of the San Juan Bautista quadrangle, California. 1946. 112 pp., 12 pls., 1 index map, 10 figs.

Contains: Map of California, index to quadrangles published by Division of Mines, op. p. 7; Preface, by Olaf P. Jenkins, pp. 7-8; Geology of the San Juan Bautista quadrangle, California, by John Eliot Allen, pp. 9-75, pls. 1-8, figs. 1-10; Operations of the Granite Rock Company quarry and plant at Logan, San Benito County, by Royal E. Fowle, pp. 77-81, pls. 9-12.

The following, included with bulletin, were also distributed separately: Geologic map of the San Juan Bautista quadrangle, California, scale 1:62,500, pl. 1; Economic mineral map of the San Juan Bautista quadrangle showing position of structure sections, scale 1:62,500, pl. 2; Structure sections across San Juan Bautista quadrangle, scale 1" = 1 mi., pl. 3

134. Geological investigations of chromite in California, prepared under the direction of Olaf P. Jenkins.

Issued in separate parts and chapters, as indicated below.

(a) Part I, Klamath Mountains.

Chapter 1, Chromite deposits of Del Norte County, California, by Francis G. Wells, Fred W. Cater, Jr. and Garn A. Rynearson, pp. 1-76, pls. 1-11, 9 figs., 1946.

The following, included with report, was also distributed separately: Topographic map of Del Norte County, California, showing distribution of peridotite and location of chromite deposits, scale 1" = 2 mi.

Chapter 2, Chromite deposits of Siskiyou County, California, by Francis G. Wells and Fred W. Cater, Jr., pp. 77-127, pls. 12-18, 4 figs., 1950.

The following, included with report, was also distributed separately: Topographic map of Siskiyou County west of meridian 122° 10', showing distribution of known peridotite and location of chromite occurences, scale 1" = 2 mi.

(b) Part II, Coast Ranges.

Chapter 1, Chromite deposits of the northern Coast Ranges of California, by D. H. Dow and T. P. Thayer, pp. 1-38, 2 figs., 1946.

Chapter 2, Chromite deposits of the southern Coast Ranges of California, by George W. Walker and Allan B. Griggs, pp. 39-88, 8 pls., 5 figs., 1953.

(c) Part III, Sierra Nevada.

Chapter 1, Chromite deposits of Tuolumne and Mariposa Counties, California, by Fred W. Cater, Jr., pp. 1-32, pls. 1-4, 2 figs., 1948.

Chapter 2, Chromite deposits of Calaveras and Amador Counties, California, by Fred W. Cater, Jr., pp. 33-60, pl. 5, fig. 1, 1948.

Chapter 3, Chromite deposits of Tulare and eastern Fresno Counties, California, by Garn A. Rynearson, pp. 61-104, pls. 6-7, 7 figs., 1948.

Chapter 4, Chromite deposits of El Dorado County, California, by Fred W. Cater, Jr., Garn A. Rynearson, and Donald H. Dow, pp. 105-167, pls. 8-15, 6 figs., 1951.

Chapter 5, Chromite deposits in the northern Sierra Nevada, California (Placer, Nevada, Sierra, Yuba, Butte, and Plumas Counties), by Garn A. Rynearson, pp. 169-323, pls. 12-15, 10 figs., 1953.

135. Placer mining for gold in California, by Charles Volney Averill. 1st ed., 1946. 2d ed., 1950. 377 pp., 4 pls., 106 figs.

Contains: *Placer mining methods, pp. 11-146, pl. 1, figs. 1-45, which includes* Small-scale methods, pp. 13-33, figs. 1-9; Dragline dredging, pp. 34-48, pl. 1, figs. 10-18; Dryland dredges, pp. 49-50, fig. 19; Bucket-line dredging, by Charles M. Romanowitz and Herbert A. Sawin, pp. 51-60, figs. 20-22; Becker-Hopkins single-bucket dredge, by H. A. Sawin, pp. 61-62, figs. 23-24; Jigging applied to gold dredging, by P. Malozemoff, pp. 63-72, fig. 25; Notes on jigs for gold dredges, by F. W. Collins, pp. 73-76, figs. 26-29; Treatment of black sand, pp. 77-80, fig. 30; Drift min-

ing, general description, pp. 81-88, fig. 31; A synoptic presumption regarding California's drift mines, by L. L. Huelsdonk, pp. 89-91; Hydraulic mining, pp. 93-143, figs. 32-45; Debris dams, pp. 144-146. *Geology of placer deposits, pp. 146-216, figs. 46-80, which includes* New technique applicable to the study of placers, by Olaf P. Jenkins, pp. 149-216, figs. 46-80. *Prospecting and sampling placer deposits, pp. 217-227, which includes* Sampling, pp. 219-226; Geophysical prospecting, p. 227. *Placer mines by counties, pp. 229-322, figs. 81-106, which includes* Amador, Butte, Calaveras, El Dorado, Fresno, Humboldt, Imperial, Kern, Los Angeles, Madera, Mariposa, Merced, Nevada, Placer, Plumas, Sacramento, San Bernardino, San Joaquin, Shasta, Sierra, Siskiyou, Stanislaus, Trinity, Tuolumne, Yuba Counties, pp. 231-315, figs. 81-104; Deep gravels dredged successfully, by Herbert A. Sawin, pp. 317-322, figs. 105-106. *Appendix—laws affecting placer mining, pp. 323-336, which includes* The Caminetti Law, pp. 325-330; Amendments to the Caminetti Act, pp. 331-333; Definition of hydraulic mining, p. 333; Definition of hydraulic mining from California Civil Code, p. 333; Trinity and Klamath River fish and game district, p. 334; Protection of domestic water supplies, pp. 335-336; Placer mining districts, p. 336; Map showing Tertiary gravel channels, Nevada County, California, scale 2″ = 3 mi. (approx.), pl. 2, in pocket.

The following, included with the bulletin, were also distributed separately: Geologic map of northern Sierra Nevada showing Tertiary river channels and Mother Lode belt, prepared by Olaf P. Jenkins, scale 1″ = 8 mi., pl. 3, (*Report accompanying geologic map of northern Sierra Nevada*, by Olaf P. Jenkins, printed on back). Map of northern California showing placer mining areas, scale 1″ = 18 mi., pl. 4.

136. Minerals of California, by Joseph Murdoch and Robert W. Webb. 1948. 402 pp., 4 pls., 1 fig.

137. California mineral production and directory of mineral producers for 1945, by Henry H. Symons. 1946. 221 pp.

138. Manner of locating and holding mineral claims in California, by A. H. Ricketts (with revisions by C. A. Logan). 1946. 35 pp.

139. California mineral production for 1946, by C. V. Averill, C. R. King, Henry H. Symons, and F. F. Davis. 1948. 176 pp., 4 pls.

Contains: Summary of the mineral industry in California during the year 1946, pp. 9-10; Fuels, pp. 11-27; Metals, pp. 29-56; Industrial nonmetallic materials, pp. 57-102; Salines, pp. 103-112. Appendix, pp. 113-172: List of counties in California, showing amount and value of the mineral substances produced in each during 1946, pp. 115-127; Directory of producers of metallic and nonmetallic minerals in California in 1946, pp. 129-167; List of smelters reporting purchase of California metals produced in 1946, p. 168; List of custom mills and commercial grinding plants in California, p. 169; List of quicksilver buyers and mineral brokers, p. 170; List of commercial assay and testing laboratories, p. 171.

140. Geology of the Tesla quadrangle, California, by Arthur S. Huey. 1948. 75 pp., 11 pls., 3 figs.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Tesla quadrangle, scale 1:62,500; Topographic map of Tesla quadrangle with red overprint showing mineral deposits, structure-section lines, and water-supply tunnel, scale 1:62,500; Structure sections across Tesla quadrangle.

141. Geologic guidebook along Highway 49—Sierran gold belt—the Mother Lode country. 1st printing, 1948. 2d printing, 1949. 3d printing, 1953. 4th printing, 1955. 5th printing, 1960, 164 pp., 2 pls., 221 figs., 10 maps.

Contains: Preface, by Olaf P. Jenkins, p. 7; Publications consulted, p. 8; Sierran roads of today and yesterday, by Dorothy G. Jenkins, pp. 9-12, 2 figs.; The discovery of gold in California, by Donald C. Cutter,

pp. 13-17, 2 figs.; History of placer mining for gold in California, by Charles V. Averill, p. 19, 6 figs.; Sierra Nevada province, by Olaf P. Jenkins, p. 21, 1 fig.; Geologic history of the Sierran gold belt, by Olaf P. Jenkins, pp. 23-30, 11 figs.; History of mining and milling methods in California, by C. A. Logan, pp. 31-34, 1 fig.; Geologic maps and notes along Highway 49, by Oliver E. Bowen Jr. and Richard A. Crippen Jr., pp. 35-86, 42 figs., 10 maps; The formation of quartz veins, by John A. Burgess, pp. 87-88, 3 figs.; Mining on Carson Hill, by John A. Burgess, pp. 89-90; Survey of building structures of the Sierran gold belt, 1848-70, by Robert F. Heizer and Franklin Fenenga, pp. 91-164, 168 figs.

142. The counties of California—mineral resources and mineral production during 1947, prepared under the direction of Olaf P. Jenkins, contributing authors Charles V. Averill, Oliver E. Bowen Jr., Fenelon F. Davis, Clarence A. Logan, Lewis A. Norman Jr., John C. O'Brien, Reid J. Sampson, Richard M. Stewart, Henry H. Symons, William E. Ver Planck. 1949. 197 pp., 12 pls., 1 fig.

143. Geology of the Hollister quadrangle, California, by N. L. Taliaferro.

Contains: Colored geologic map on topographic base of Hollister quadrangle, scale 1:62,500; Topographic map of Hollister quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. 1948. No text.

144. Copper in California. 1948. 429 pp., 9 pls. in text, 52 pls. in separate pocket, map, 20 figs.

Contains: **Part 1, Detailed reports on the Foothill copper belt, pp. 9-157, 16 figs., 61 pls.:** Foothill copper-zinc belt of the Sierra Nevada, California, by George R. Heyl, pp. 11-29, pl. 1; Zinc-copper deposits of the Big Bend mine, Butte County, California, by John H. Eric, pp. 31-42, 1 fig., pls. 2-4; Geology of the Lilyama and Pioneer mines, El Dorado County, California, by Manning W. Cox, Donald C. Wyant, and George R. Heyl, pp. 43-47, pls. 5-6; Newton copper mine, Amador County, California, by George R. Heyl and John H. Eric, pp. 49-60, 2 figs., pls. 7-13; Penn zinc-copper mine, Calaveras County, California, by George R. Heyl, Manning W. Cox, and John H. Eric, pp. 61-84, 4 figs., pls. 14-32; The Grayhouse area, Amador County, California, by George R. Heyl, pp. 85-91, 2 figs., pl. 33; Ore deposits of Copperopolis, Calaveras County, California, by George R. Heyl, pp. 93-110, pls. 34-40; The zinc-copper mines of the Quail Hill area, Calaveras County, California, by George R. Heyl, pp. 111-126, 3 figs., pls. 41-46; La Victoria copper mine, Mariposa County, California, by Manning W. Cox and Donald G. Wyant, pp. 127-132, 1 fig., pls. 47-49; Zinc deposits of the American Eagle—Blue Moon area, Mariposa County, California, by John H. Eric and Manning W. Cox, pp. 133-150, 1 fig., pls. 50-58; The Jesse Belle copper mine, Madera County, California, by Manning W. Cox and Donald G. Wyant, pp. 151-157, 2 figs., pls. 59-61. **Part 2, Economics and treatment of ores, pp. 159-196, 4 figs.:** The marketing and metallurgy of complex ores in California, by Hadley R. Bramel, pp. 161-196, 4 figs. **Part 3, Tabulation of copper properties to accompany Economic Mineral Map of California No. 6 (Copper), pp. 197-387, 2 figs.:** Tabulation of copper deposits of California, by John H. Eric, pp. 199-357, 2 figs.; Bibliography, by Hadley R. Bramel, John H. Eric, and Elisabeth L. Egenhoff, pp. 359-387. Index, pp. 389-429.

The following, included with the bulletin, was also distributed separately: Outline geologic map of California showing locations of copper properties (Economic mineral map of California No. 6—Copper), scale 1:1,000,000, prepared under direction of Olaf P. Jenkins.

145. Geology of the Copperopolis quadrangle, California, by N. L. Taliaferro.

Contains: Colored geologic map on topographic base of Copperopolis quadrangle, scale 1:62,500; Topographic map of Copperopolis quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. 1948. No text.

146. Geology and mineral deposits of the Lake Elsinore quadrangle, California. 1959. 154 pp., 7 pls., 24 figs.

Contains: Geology of the Lake Elsinore quadrangle, California, by René Engel, pp. 9-58, pls. 1-3, 7 figs.; Mineral deposits of Lake Elsinore quadrangle, California, by René Engel, Thomas E. Gay Jr., and B. L. Rogers, pp. 59-144, pls. 4-7, 17 figs.; Index, pp. 145-154.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Lake Elsinore quadrangle, scale 1:62,500; Topographic map of Lake Elsinore quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. 1948.

147. Geology of the Quien Sabe quadrangle, California. 1949. 60 pp., 11 pls., 6 figs.

Contains: Geology of the Quien Sabe quadrangle, California, by Carlton James Leith, pp. 7-35, pls. 1-7, 2 figs.; Quicksilver and antimony deposits of the Stayton district, California, by Edgar H. Bailey and W. Bradley Myers, pp. 37-56, pls. 8-11, 4 figs.; Index, pp. 57-60.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Quien Sabe quadrangle, scale 1:62,500; Topographic map of Quien Sabe quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500; Geologic structure sections across Quien Sabe quadrangle.

148. Geology of the Blue Lake quadrangle, California. 1950. 36 pp., 13 pls., 2 figs.

Contains: Geology of the Blue Lake quadrangle, California, by George A. Manning and Burdette A. Ogle, pp. 7-31, 13 pls., 2 figs.; Index, pp. 33-36.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Blue Lake quadrangle, scale 1:62,500; Topographic map of Blue Lake quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500; Geologic structure sections across Blue Lake quadrangle.

149. Geology and mineral deposits of an area north of San Francisco Bay, California—Vacaville, Antioch, Mount Vaca, Carquinez, Mare Island, Sonoma, Santa Rosa, Petaluma, and Point Reyes quadrangles. 1949. 135 pp., 24 pls., 4 figs.

Contains: Geology and mineral deposits of an area north of San Francisco Bay, California—Vacaville, Antioch, Mount Vaca, Carquinez, Mare Island, Sonoma, Santa Rosa, Petaluma, and Point Reyes quadrangles, by Charles E. Weaver, pp. 7-122, 24 pls., 4 figs.; Index, pp. 123-135. Maps (pls. 1-24) are in separate map box.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Santa Rosa quadrangle, scale 1:62,500. Topographic map of Santa Rosa quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Sonoma and Mt. Vaca quadrangles, scale 1:62,500. Topographic map of Sonoma and Mt. Vaca quadrangles with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Vacaville quadrangle, scale 1:62,500. Topographic map of Vacaville quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Pt. Reyes quadrangle, scale 1:62,500. Topographic map of Pt. Reyes quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Petaluma quadrangle, scale 1:62,500. Topographic map of Petaluma quadrangle with

red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Mare Island quadrangle, scale 1:62,500. Topographic map of Mare Island quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Carquinez quadrangle, scale 1:62,500. Topographic map of Carquinez quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Colored geologic map on topographic base of Antioch quadrangle, scale 1:62,500. Topographic map of Antioch quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500. Geologic sections across an area north of San Francisco Bay.

150. Geology of southwestern Santa Barbara County, California—Point Arguello, Lompoc, Point Conception, Los Olivos, and Gaviota quadrangles. 1st printing, 1950. 2d printing, 1961. 95 pp., 17 pls., 6 figs., frontis.

Contains: Geology of southwestern Santa Barbara County, California (Point Arguello, Lompoc, Point Conception, Los Olivos, and Gaviota quadrangles), by T. W. Dibblee Jr., pp. 7-84, 17 pls., 6 figs.; Index, pp. 85-95.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Point Arguello, Lompoc, and Point Conception quadrangles, scale 1:62,500; Topographic map of Point Arguello, Lompoc, and Point Conception quadrangles with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500; Colored geologic map on topographic base of Los Olivos and Gaviota quadrangles, scale 1:62,500; Topographic may of Los Olivos and Gaviota quadrangles with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500; Geologic structure sections across southwestern Santa Barbara County.

151. Geology of the Macdoel quadrangle, California. 1949. 78 pp., 4 pls., 13 figs.

Contains: Geology of the Macdoel quadrangle, California, by Howel Williams, pp. 7-60, pls. 1-4, 8 figs.; Circular soil structures in northeastern California, by Peter H. Masson, pp. 61-71, 5 figs.; Index, pp. 73-78.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Macdoel quadrangle, scale 1:125,000; Topographic map of Macdoel quadrangle with red overprint showing mineral deposits and structure-section lines, scale 1:125,000; Geologic sections across the Macdoel quadrangle, scale 1″ = 2 mi.

152. Geologic description of the manganese deposits of California—supplement to Bulletin 125, by Parker D. Trask, Glen Alvey, Edgar Bowles, Doak C. Cox, S. C. Creasey, Max D. Crittenden Jr., Theo Crook, E. F. Davis, J. B. Hadley, F. S. Hudson, Charles B. Hunt, S. G. Lasky, J. M. Nelson, H. P. Norbeck, R. R. Morse, W. G. Pierce, Spangler Ricker, A. F. Shride, Frank S. Simons, N. L. Taliaferro, Fred D. Trauger, Charles R. Warren, Ivan F. Wilson, Alfred O. Woodford. 1950. 378 pp., 20 pls., 12 figs.

153. Geology and mineral resources of the Neenach quadrangle, California, by John H. Wiese. 1950. 53 pp., 12 pls., 1 fig.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of Neenach quadrangle, scale 1:62,500; Topographic map of Neenach quadrangle with red overprint showing mineral deposits and structure-section lines; Geologic structure sections across Neenach quadrangle.

154. Geologic guidebook of the San Francisco Bay counties—history, landscape, geology, fossils, minerals, industry, and routes to

travel, prepared under the direction of Olaf P. Jenkins. 1st printing, 1951. 2d printing, 1959. 392 pp., 1 pl., maps 1-7, 280 figs.

Contains: Preface, by Olaf P. Jenkins, p. 7, frontispiece.

Part 1, Historical background, pp. 9-72, 41 figs.: Opening of the Golden Gate, by Dorothy G. Jenkins, pp. 11-30, 7 figs.; Place names in the San Francisco Bay counties, by Erwin G. Guddle, pp. 31-38, 2 figs.; Indians of the San Francisco Bay area, by Robert F. Heizer, pp. 39-56, 17 figs.; Adobe houses in the San Francisco Bay region, by J. N. Bowman, pp. 57-64, 9 figs.; Old lime kilns near Olema, by Adan E. Treganza, pp. 65-72, 6 figs.

Part 2, History of the landscape, pp. 73-106, 21 figs.: Geologic history of San Francisco Bay, by George D. Louderback, pp. 75-94, 15 figs.; Development of the landscape of the San Francisco Bay counties, by Arthur David Howard, pp. 95-106, 6 figs.

Part 3, Geologic history, pp. 107-174, 1 pl., maps 1-7, 36 figs.: History of geologic investigation in the bay region, by V. L. Vander Hoof, pp. 109-116, 4 figs.; Geology of the San Francisco Bay counties, by N. L. Taliaferro, pp. 117-150, pl. 1, 8 figs.; History of earthquakes in the San Francisco Bay area, by Perry Byerly, pp. 151-160, 21 figs.; Geologic map of the San Francisco Bay region, by Oliver E. Bowen Jr. and Richard A. Crippen Jr., pp. 161-174, maps 1-7, 3 figs.

Part 4, Prehistoric life, pp. 175-202, 28 figs.: Prehistoric land animals of the San Francisco Bay region, by R. A. Stirton, pp. 177-186, 6 figs.; Invertebrate fossils and fossil localities in the San Francisco Bay area, by Leo George Hertlein, pp. 187-192, 2 figs.; Prehistoric forests of the San Francisco Bay area, by Ralph W. Chaney, pp. 193-202, 20 figs.

Part 5, Mineral industry, pp. 203-290, 61 figs.: California's contribution of mineral raw material to San Francisco industries, by Lauren A. Wright, pp. 205-210, 2 figs.; Utilization of minerals in industries of the San Francisco Bay counties, by Charles Volney Averill, pp. 211-218, 4 figs.; Salines in the bay area, by W. E. Ver Planck, pp. 219-222, 1 fig.; Mineral fuels of the San Francisco Bay counties, by Gordon B. Oakeshott, pp. 223-230, 2 figs.; Limestone and the cement industry of the San Francisco Bay counties, by Oliver E. Bowen, Jr., pp. 231-234, 1 fig.; The building stone and aggregate industry of the San Francisco Bay counties, by Mort D. Turner, pp. 235-238, 3 figs.; Volcanic rocks useful in the San Francisco Bay area, by C. W. Chesterman, pp. 239-246, 13 figs.; Clay and the ceramic industry of the San Francisco Bay counties, by Mort D. Turner, pp. 247-252, 4 figs.; Ceramic education and industry in the San Francisco Bay area, by Joseph Pask, pp. 253-258, 4 figs.; Manganese and quicksilver mineralization in the San Francisco Bay region, by Oliver E. Bowen, Jr., pp. 259-262, 4 figs.; The New Almaden quicksilver mines, by Edgar H. Bailey, pp. 263-270, 8 figs.; Serpentine and chromite deposits of the San Francisco Bay counties, by Francis G. Wells, pp. 271-274, 1 fig.; Magnesite mineralization in the Red Mountain district, by A. J. Bodenlos, pp. 275-280, 8 figs.; Diatom deposits, by G. Dallas Hanna, pp. 281-290, 6 figs.

Part 6, Water, pp. 291-298, 2 figs.: Surface water supplies in the San Francisco Bay area, by Robert L. Wing, pp. 293-298, 2 figs.

Part 7, Places to go and routes to travel, pp. 299-379, 90 figs.: Geology of the Farallon Islands, by G. Dallas Hanna, pp. 301-309, 19 figs.; Unusual minerals of the bay area, by Richard A. Crippen Jr., pp. 311-314; Highways and byways of particular geologic interest, by Oliver E. Bowen, Jr., pp. 315-379, 71 figs.

Glossary and Index, pp. 381-392: Glossary, pp. 383-386; Index, pp. 387-392.

155. Minerals useful to California agriculture, prepared under the direction of Olaf P. Jenkins. 1951. 148 pp., 3 pls., 23 figs., frontis.

Contains: Preface, by Olaf P. Jenkins, p. 7; Exploring the soils of California, by Hans Jenny and collaborators, pp. 9-66, pls. 1-3, 23 figs.; Commercial fertilizers, by William E. Ver Planck, pp. 67-72; Minerals of

commercial fertilizers, by William E. Ver Planck, pp. 73-78; Agricultural minerals in California, by Robert Z. Rollins, pp. 79-103; Agricultural gypsum, by Robert Z. Rollins, pp. 105-116; Gypsum resources of California, by William E. Ver Planck, pp. 117-121; Limestone and marl resources of California, by Oliver E. Bowen, Jr., pp. 123-127; California sources of sulfur and sulfuric acid, by James W. Vernon, pp. 129-130; California's resources of the minerals of minor agricultural use, by Lauren A. Wright, pp. 131-138; Index, pp. 139-148.

156. Mineral commodities of California—geologic occurrence, economic development, and utilization of the state's mineral resources, by the staff of the Division of Mines, under the direction of Olaf P. Jenkins. 1950. 443 pp., 17 pls., 34 figs., frontis.

Contains: Preface, by Olaf P. Jenkins, pp. 11-13; Natural environment of mineral resources of California, by Olaf P. Jenkins, pp. 15-21, pl. 1.

Part 1, Summary of mineral wealth in California for 1948, pp. 23-58: Mineral production in California during 1948 compared with 1947, by Henry H. Symons, Fenelon F. Davis, and Charles V. Averill, pp. 25-40; Contributions of the counties to the mineral production of California during 1948, by Henry H. Symons, Fenelon F. Davis, and Charles V. Averill, pp. 41-58.

Part 2, Mineral fuels, pp. 59-108, 4 figs.: Coal, by Lewis T. Braun, pp. 61-64; Coke, by James W. Vernon, pp. 64-65; Natural gas, by Gordon B. Oakeshott, pp. 66-79, 1 fig.; Natural gasoline and liquefied petroleum gases, by Gordon B. Oakeshott, pp. 80-83; Peat, by Lewis T. Braun, pp. 83-84; Petroleum, by Gordon B. Oakeshott, pp. 85-108, 3 figs.

Part 3, Nonmetallic industrial materials, pp. 109-282, pls. 2-17, 20 figs.: Abrasives, by Lewis T. Braun, pp. 111-116; Andalusite, kyanite, and sillimanite, by Lauren A. Wright, pp. 116-118; Arsenic, by L. A. Norman Jr., pp. 118-120; Asbestos, by Fenelon F. Davis, pp. 121-124; Asphalt and bituminous rock, by Gordon B. Oakeshott, pp. 124-130; Barite, by Lewis T. Braun, pp. 130-132; Beryllium, by Lauren A. Wright, pp. 132-133; Black sands, by Gordon B. Oakeshott, pp. 133-136; Calcite (optical), by Lauren A. Wright, pp. 136-138; Cement, by Oliver E. Bowen Jr., pp. 138-142, 1 fig.; Clays, by Mort D. Turner, pp. 142-150, 1 fig.; Diatomite, by Gordon B. Oakeshott, pp. 150-155, 1 fig.; Dolomite by Clarence A. Logan and Lauren A. Wright, pp. 155-158; Feldspar, by Lauren A. Wright, pp. 158-161; Fluorspar, by Charles W. Chesterman, pp. 161-164; Gem stones, by Lauren A. Wright, pp. 164-169; Graphite, by Gordon B. Oakeshott, pp. 169-171; Lime and limestone, by Oliver E. Bowen Jr., pp. 171-176, 1 fig.; Magnesite, magnesium, and magnesium compounds, by James W. Vernon, pp. 177-184, 1 fig.; Mica, by Lauren A. Wright, pp. 184-186; Nitrogen compounds, by William E. Ver Planck Jr., pp. 186-187; Pebbles for grinding, by L. A. Norman Jr., pp. 187-189; Phosphates, by Lewis T. Braun, pp. 189-192; Pumice, pumicite, and perlite, by Charles W. Chesterman, pp. 192-203, 1 fig.; Pyrites, by Charles W. Chesterman, pp. 203-206, 1 fig.; Quartz crystal, by Lauren A. Wright, pp. 206-208; Salines, by William E. Ver Planck Jr., pp. 208-251, 9 figs.; Sand and gravel, by Mort D. Turner, pp. 251-258, 1 fig.; Slate, by Mort D. Turner, pp. 258-260; Stone, by Mort D. Turner, pp. 260-270, 1 fig.; Strontium minerals, by William E. Ver Planck Jr., pp. 270-273, 1 fig.; Sulfur, by James W. Vernon, pp. 273-275; Sulfuric acid, by James W. Vernon, pp. 275-276; Talc, soapstone, and pyrophyllite, by Lauren A. Wright, pp. 276-282, 1 fig.

Part 4, Metals, pp. 283-370, 10 figs.: Aluminum, by Mort D. Turner, pp. 285-288; Antimony, by L. A. Norman Jr., pp. 288-291; Bismuth, by Charles W. Chesterman, pp. 291-293; Cadmium, by James W. Vernon, pp. 293-294; Chromite, by Richard A. Crippen Jr., pp. 294-298, 1 fig.; Cobalt, by Lewis T. Braun, pp. 299-300; Copper, by John C. O'Brien and James W. Crosby III, pp. 300-307, 1 fig.; Ferro-alloys, by James W. Vernon, pp. 308-309; Gold, by Clarence A. Logan, pp. 309-315, 1 fig.; Iron, by James W. Vernon, pp. 315-319, 1 fig.; Lead, by Richard M. Stewart, pp. 319-324,

1 fig.; Manganese, by Richard A. Crippen Jr., pp. 324-329, 1 fig.; Mercury, by Richard A. Crippen Jr., pp. 330-337, 1 fig.; Molybdenum, by Richard M. Stewart, pp. 337-340; Platinum and allied metals, by Clarence A. Logan, pp. 340-343; Silver, by Richard M. Stewart, pp. 343-349, 1 fig.; Tin, by L. A. Norman Jr., pp. 349-352; Titanium, by Gordon B. Oakeshott, pp. 352-355; Tungsten, by Richard M. Stewart, pp. 355-361, 1 fig.; Uranium, thorium, and rare-earth elements, by Charles W. Chesterman, pp. 361-363; Zinc, by John C. O'Brien, pp. 364-368, 1 fig.; Zirconium, by Samuel R. Hoffman, pp. 368-370.

Part 5, Directory of mineral producers, dealers, and commercial laboratories, pp. 371-421: Directory of producers of metallic and nonmetallic minerals in California during 1948, pp. 373-417; List of smelters and mineral dealers reporting purchase of California metals produced in 1948, p. 418; List of mineral dealers, custom mills, and commercial grinding plants in California, pp. 419-420; List of commercial assay and testing laboratories, pp. 420-421.

Index, pp. 423-443.

The following, included with the bulletin, was also distributed separately: Map of California, showing distribution of mineral deposits, scale 1" = 40 mi., and Salient features of the geomorphic provinces, by Olaf P. Jenkins.

157. Geology of the San Jose-Mount Hamilton area, California, by Max D. Crittenden, Jr. 1951. 74 pp., 11 pls., 14 figs.

The following, included with report, were also distributed separately: Colored geologic map on topographic base of the San Jose-Mount Hamilton area, scale 1:62,500; Topographic map of the San Jose-Mount Hamilton area with red overprint showing mineral deposits, scale 1:62,500; structure sections.

158. Evolution of the California landscape, by Norman E. A. Hinds. 1st printing, 1952. 2d printing, 1957. 3d printing, 1960. 240 pp., 156 figs., frontis.

The following, included with the first printing only, were also distributed separately: Topographic maps [explanation of, by U.S. Geological Survey]; Plate 1, Shaded relief map of California, scale 1¼" = 40 mi. (approx.), Hal Shelton, Chief Artist; Plate 2, Geomorphic map of California, scale 1¼" = 40 mi. (approx.), prepared by Olaf P. Jenkins.

The following, only distributed separately, was published as a supplement to Bulletin 158; Suppl. Map A, Shaded relief map of California, scale 1" = 20 mi. 1961.

159. Crystalline rocks of southwestern California. 1951. 136 pp., 7 pls., 6 figs., frontis.

Contains: Crystalline rocks of the Corona, Elsinore, and San Luis Rey quadrangles, southern California, by Esper S. Larsen Jr., pp. 7-50, pl. 1, 3 figs.; Geology of the Cuyamaca Peak quadrangle, San Diego County, California, by Donald L. Everhart, pp. 51-115, pls. 2-5, 2 figs.; Groundwater in the bedrock in western San Diego County, California, by Richard Merriam, pp. 117-128, pl. 7, 1 fig.; Index, pp. 129-136.

The following, included with report, were also distributed separately: Colored geologic map on topographic base of the Cuyamaca Peak quadrangle, scale 1:62,500; Topographic map of the Cuyamaca Peak quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500.

160. Geology of the Saltdale quadrangle, California. 1952. 11 pls., 5 figs.

Contains: Geology of the Saltdale quadrangle, Kern County, California, by T. W. Dibblee Jr., pp. 7-43, pls. 1-11, figs. 1-8; Mineral deposits of Saltdale quadrangle, by T. W. Dibblee Jr. and T. M. Gay Jr., pp. 45-64.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Saltdale quadrangle, scale 1:62,500; Topographic map of the Saltdale quadrangle with red overprint showing mineral deposits, scale 1:62,500; Geologic structure sections across Saltdale quadrangle.

161. Geology of the Healdsburg quadrangle, California. 1951. 70 pp., 8 pls., 8 figs.

Contains: Geology of the Healdsburg quadrangle, California, by William Kelso Gealey, pp. 7-50, pls. 1-8, 3 figs.; Mineralogy of the California glaucophane schists, by George Switzer, pp. 5-70, 5 figs.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Healdsburg quadrangle, scale 1:62500; Geologic structure sections; Post-Jurassic diastrophic events in California Coast Ranges.

162. Geology of the Sebastopol quadrangle, California, by Russell B. Travis. 1952. 32 pp., 7 pls., 2 figs.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Sebastopol quadrangle, scale 1:62500; Topographic map of the Sebastopol quadrangle with red overprint showing mineral deposits, scale 1:62500.

163. Gypsum in California, by William E. Ver Planck. 1952. 151 pp., 52 pls., 11 figs.

164. Geology of Eel River Valley area, Humboldt County, California, by Burdette A. Ogle. 1953. 128 pp., 6 pls., 14 figs.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Eel River Valley area (parts of Ferndale, Fortuna, and Scotia quadrangles), scale 1:62500; Structure sections across Eel River Valley area, California.

165. Geology and mineral deposits of the Barstow quadrangle, California. 1st printing, 1954. 2d printing, 1955, 208 pp., 9 pls., 89 figs., frontis.

Contains: Geology and mineral deposits of Barstow quadrangle, San Bernardino County, California, by Oliver E. Bowen Jr., pp. 7-185, 84 figs., 9 pls.; Thermal properties of ceramic materials from Barstow quadrangle, California, by Joseph A. Pask and Oliver E. Bowen Jr., pp. 186-199, 5 figs.; Index, pp. 201-208.

The following, included with the report, were also distributed separately: Geologic map of Barstow quadrangle, scale 1:125,000; Economic map of Barstow quadrangle, scale 1:125,000; Geologic structure sections across Barstow quadrangle.

166. Geology of Lower Lake quadrangle, California, by James C. Brice, containing a section of economic geology by James C. Brice and J. Grant Goodwin. 1953. 72 pp., 7 pls., 3 figs.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Lower Lake quadrangle, California, scale 1:62500; Topographic map of the Lower Lake quadrangle with red overprint showing mines and mineral deposits, scale 1:62500; Structure sections across Lower Lake quadrangle; set of maps and sections.

167. Geology of the Ortigalita Peak quadrangle, California, by Louis I. Briggs Jr. 1953. 61 pp., 4 pls., 33 figs.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Ortigalita Peak quadrangle, California, scale 1:62500; Topographic map of the Ortigalita Peak quadrangle with red overprint showing mineral deposits, scale 1:62500.

168. Geology of the Breckenridge Mountain quadrangle, California, by T. W. Dibblee Jr. and Charles W. Chesterman. 1953. 56 pp., 3 pls., 32 figs.

The following, included with the report, were also distributed separately: Colored geologic map on topographic base of the Breckenridge Mountain quadrangle, California, scale 1:62500. Topographic map of the Breckenridge Mountain quadrangle with red overprint showing mineral deposits, scale 1:62500.

169. Clays and clay technology—proceedings of the First National Conference on Clays and Clay Technology, ed. by Joseph A. Pask and Mort D. Turner. 1st printing, 1955. 2d printing, 1961. 326 pp., 176 figs.

Contains: Contributing authors, pp. 3-4; Letter of transmittal, p. 5; Preface, p. 7; Abbreviations, p. 8; Contents, p. 9.

(a) **Introduction, pp. 11-15:** Objectives of the First National Conference on Clays and Clay Technology, and definitions of terms used in the industry, by Ralph E. Grim, pp. 13-15.

(b) **Part I, Geology and mineralogy of clays, pp. 17-43, 3 figs.:** Formation and occurrence of clay minerals, by Paul F. Kerr, pp. 19-32; Structural mineralogy of clays, by George W. Brindley, pp. 33-43, 3 figs.

(c) **Part II, Properties of clays, pp. 45-85, 25 figs.:** Electrochemical properties of clays, by Lannes E. Davis, pp. 47-53, 2 figs.; Ion exchange reactions of clays, by D. R. Lewis, pp. 54-69, 6 figs.; Adsorptive and swelling properties of clay-water system, by Isaac Barshad, pp. 70-77, 8 figs.; Interlamellar sorption by clay minerals, by Douglas M. C. MacEwan, pp. 78-85, 9 figs.

(d) **Part III, Methods of identifying clays and the interpretation of results, pp. 87-163, 49 figs.:** Particle size distribution in clays, by A. L. Johnson, pp. 89-91; Interpretation of chemical analyses of clays, by W. P. Kelley, pp. 92-94; Interpretation of chemical analyses of montmorillonites, by Bernard B. Osthaus, pp. 95-100; Petrographic study of clay materials, by Ralph E. Grim, pp. 101-104; Dye adsorption as a method of identifying clays, by Charles G. Dodd, pp. 105-111; Infrared analysis of clays and related minerals, by Paul G. Nahin, pp. 112-118, 10 figs.; Identification of clay minerals by x-ray diffraction analysis, by George W. Brindley, pp. 119-129, 5 figs.; Electron microscopy as a method of identifying clays, by Thomas F. Bates, pp. 130-150, 20 figs.; Differential thermal analysis of clays and carbonates, by Richards A. Rowland, pp. 151-163, 14 figs., including Selected references, by Frank J. Sans, pp. 159-163.

(e) **Part IV, Clay technology in soil science, pp. 165-187, 4 figs.:** Role of physical properties of clays in soil science, by J. B. Page, pp. 167-176, 4 figs.; Role of chemical properties of clays in soil science, by T. F. Buehrer, pp. 177-187.

(f) **Part V, Clay technology in soil mechanics, pp. 189-254, 52 figs.:** Importance of clay in applied soil mechanics, by Francis N. Hveem, pp. 191-195, 5 figs.; Physical-chemical properties and engineering performance of clays, by Richard C. Mielenz and Myrle E. King, pp. 196-254, 47 figs.

(g) **Part VI Clay technology in ceramics, pp. 255-266, 4 figs.:** Clay technology in ceramics, by Edward C. Henry, pp. 257-266, 4 figs.

(h) **Part VII, Clay technology in the petroleum industry, pp. 267-326, 39 figs.;** Use of clay in drilling fluids, by Delmar H. Larsen, pp. 269-281, 4 figs.; Role of clay in well-log interpretation, by M. R. J. Wyllie, pp. 282-305, 12 figs.; Role of clay in oil reservoirs, by Norris Johnston, pp. 306-313, 6 figs.; Use of clays as petroleum cracking catalysts, by T. H. Milliken, A. G. Oblad, and G. A. Mills, pp. 314-326, 17 figs.

170. Geology of southern California, ed. by Richard H. Jahns. 1st printing, 1954 [1955]. 2d printing (in 2 vols., index added) 1960. x, 878 pp., 31 pls., 441 text figures, index map, 60 route maps, 34 map sheets with text and illus.

Contains: (a) Preface, by Richard H. Jahns, pp. ix-x, index map of southern California, p. viii.

(b) **Chapter I, General features, 1954 [1955], 53 pp., 31 figs.:** (1) Investigations and problems of southern California geology, by Richard H. Jahns, pp. 5-29, 14 figs.; (2) Climate, vegetation, and land use in southern California, by Harry P. Bailey, pp. 31-44, 7 figs.; (3) Indian occupation in southern California, by Robert F. Heizer, pp. 45-53, 10 figs.

(c) **Chapter II, Geology of the natural provinces, 1954 [1955], 162 pp., 9 pls., 76 figs.:** (1) General geology of the Mojave Desert region, by D. F. Hewett, pp. 5-20, 3 figs.; (2) Geology of the Imperial Valley region, California, by T. W. Dibblee Jr., pp. 21-28, pl. 2, 3 figs.; (3) Geology of the Peninsular Range province, southern California and Baja California, by Richard H. Jahns, pp. 29-52, pl. 3, 11 figs.; (4) Geology of the Oceanside-San Diego coastal area, southern California, by Leo George Hertlein and U. S. Grant, pp. 53-63, 6 figs.; (5) Geology of the Los Angeles basin, by A. O. Woodford, J. E. Schoellhamer, J. G. Vedder, and R. F. Yerkes, pp. 65-81, pls. 1-1A, 8 figs.; (6) Geology of the Transverse Range province, southern California, by Thomas L. Bailey and Richard H. Jahns, pp. 83-106, pl. 4, 13 figs.; (7) General geology of the offshore area, southern California, by K. O. Emery, pp. 107-111, 4 figs.; (8) Geological summary of the San Joaquin Valley, California, by Harold W. Hoots, Ted L. Bear, and William D. Kleinpell, pp. 113-129, pls. 5-6, 14 figs.; (9) Geology of the Tehachapi Mountains, California, by John P. Buwalda, pp. 131-143, 6 figs.; (10) Geology of the central and southern Death Valley region, California, by Levi F. Noble and Lauren A. Wright, pp. 145-162, pls. 78, 8 figs.

(d) **Chapter III, Historical geology, 1954 [1955], 83 pp., 1 pl., 39 figs.:** (1) Correlation of sedimentary formations in southern California, by Gordon B. Oakeshott, Charles W. Jennings, and Mort D. Turner, pp. 5-8, pl. 1; (2) Rocks of Paleozoic age in southern California, by Charles W. Merriam, pp. 9-14; (3) Mesozoic formations and faunas, southern California and northern Baja California, by W. P. Popenoe, pp. 15-21, 4 figs.; The marine Cenozoic of southern California, by J. Wyatt Durham, pp. 23-31, 5 figs.; (5) Fossil foraminifera of the Los Angeles and Ventura regions, California, by M. L. Natland and W. T. Rothwell Jr., pp. 33-42, 7 figs.; (6) Cenozoic land life of southern California, by Donald E. Savage and Theodore Downs, with illustrations by Owen J. Poe, pp. 43-58, 10 figs. [reprinted (separately) March 1959]; (7) Marine-nonmarine relationships in the Cenozoic section of California, by J. Wyatt Durham, Richard H. Jahns, and Donald E. Savage, pp. 59-71, 4 figs.; (8) Tertiary basins of southern California, by William H. Corey, pp. 73-83, 9 figs.

(e) **Chapter IV, Structural features, 1954 [1955], 59 pp., 5 pls., 19 figs.:** (1) Tectonics of faulting in southern California, by Mason L. Hill, pp. 5-13, 3 figs.; (2) A fault map of the Mojave Desert region, by D. F. Hewett, pp. 15-18, pl. 1; (3) Seismicity of southern California, by Charles F. Richter and Beno Gutenberg, pp. 19-25, 4 figs.; (4) Rocks and structure of the northern Providence Mountains, San Bernardino County, California, by John C. Hazzard, pp. 27-35, pls. 2-4; (5) The San Andreas fault zone from Soledad Pass to Cajon Pass, California, by Levi F. Noble, pp. 37-48, pl. 5, 8 figs.; (6) Strike-slip displacement of the San Gabriel fault, southern California, by John C. Crowell, pp. 49-52, 1 fig.; (7) Turtlebacks in the central Black Mountains, Death Valley, California, by H. Donald Curry, pp. 53-59, 3 figs.

(f) **Chapter V, Geomorphology, 1954, 56 pp., 1 pl., 42 figs.:** (1) Some physiographic aspects of southern California, by Robert P. Sharp, pp. 5-10, 1 fig.; (2) Geomorphic processes in the desert, by Eliot Blackwelder, pp. 11-20, 20 figs.; (3) Physiographic features of faulting in southern California, by Robert P. Sharp, pp. 21-28, 3 figs.; (4) Beach and nearshore processes along the southern California coast, by Douglas L. Inman, pp. 29-34, 2 figs.; (5) Pleistocene lakes and drainage in the Mojave region, southern California, by Eliot Blackwelder, pp. 35-40, 5 figs.; (6) Pleistocene glaciation in the upper San Joaquin basin, Sierra Nevada, by Joseph H. Birman, pp. 41-44, pl. 1, 2 figs.; (7) Marine terraces of the Ventura region and the Santa Monica Mountains, California, by William C. Putnam, pp. 45-48, 2 figs.; (8) The nature of Cima Dome, by Robert P. Sharp, pp. 49-52, 4 figs.; (9) History of the lower Colorado River and the Imperial depression, by Chester R. Longwell, pp. 53-56, 3 figs.

(g) **Chapter VI, Hydrology, 1954, 28 pp., 10 pls., 13 figs.:** (1) Hydrology of the Los Angeles region, by Harold C. Troxell and Walter Hofmann, pp. 5-12, 8 figs.; (2) Hydrology of the Mojave Desert, by Harold C. Troxell and Walter Hofmann, pp. 13-17, 5 figs.; (3) Geology and hydrology of Ventura County, by R. G. Thomas, E. C. Marliave, L. B. James, and R. T. Bean, pp. 19-28, pls. 1-10.

(h) **Chapter VII, Mineralogy and petrology, 1954, 75 pp., 2 pls., 33 figs.:** (1) Minerals in southern California, by Joseph Murdoch and Robert W. Webb, pp. 5-12, 1 fig.; (2) Problems of the metamorphic and igneous rocks of the Mojave Desert, by Thane H. McCulloh, pp. 13-24, 2 figs.; (3) The batholith of southern California, by Esper S. Larsen Jr., pp. 25-30, 4 figs.; (4) Miocene volcanism in coastal southern California, by John S. Shelton, pp. 31-36, 1 fig.; (5) Pegmatites of southern California, by Richard H. Jahns, pp. 37-50, 13 figs.; (6) Contact metamorphism in southern California, by Ian Campbell, pp. 51-60, 7 figs.; (7) Contact metamorphism at Crestmore, California, by C. Wayne Burnham, pp. 61-70, pls. 1-2, 3 figs.; (8) Anorthosite complex of the western San Gabriel Mountains, southern California, by Donald V. Higgs, pp. 71-75, 2 figs.

(i) **Chapter VIII, Mineral deposits and mineral industry, 1954, 74 pp., 3 pls., 39 figs.:** (1) Salines in southern California, by William E. Ver Planck, pp. 5-14, 6 figs.; (2) Saline deposits of southern California, by Russell W. Mumford, pp. 15-22, 6 figs.; (3) The Mountain Pass rare earth deposits, by Jerry C. Olson and Lloyd C. Pray, pp. 23-29, pl 1, 4 figs.; (4) Tungsten in southeastern California, by Paul C. Bateman and William P. Irwin, pp. 31-40, 8 figs.; (5) Base metal and iron deposits of southern California, by Donald Carlisle, Dudley L. Davis, Malcolm B. Kildale, and Richard M. Stewart, pp. 41-50, 6 figs.; (6) Gold and silver mining districts in the Mojave Desert region of southern California, by Dion L. Gardner, pp. 51-58, pls. 2-3, 3 figs.; (7) Occurrence and use of nonmetallic commodities in southern California, by Lauren A. Wright, Charles W. Chesterman, and L. A. Norman Jr., pp. 59-74, 6 figs.

(j) **Chapter IX, Oil and gas, 1954, 32 pp., 14 figs.:** (1) History of oil exploration and discovery in California, by Harold W. Hoots and Ted L. Bear, pp. 5-9, 5 figs.; (2) Origin, migration, and trapping of oil in southern California, by Frank S. Parker, pp. 11-19, 2 figs.; (3) Oil and gas production in California, by Frank B. Carter, pp. 21-28, 3 figs.; (4) Stratigraphic traps for oil and gas in the San Joaquin Valley, by Harold W. Hoots, Ted L. Bear, and William D. Kleinpell, pp. 29-32, 4 figs.

(k) **Chapter X, Engineering aspects of geology, 1954, 24 pp., 12 figs.:** (1) Earthquakes and earthquake damage in southern California, by Charles F. Richter, pp. 5-10, 8 figs.; (2) Residential building-site problems in Los Angeles, California, by John T. McGill, pp. 11-18, 1 fig.; (3) Subsidence of the Wilmington oil field, California, by U. S. Grant, pp. 19-24, 3 figs.

(l) **Geologic guide no. 1,** Geologic guide for the western Mojave Desert and Death Valley region, southern California, by Lauren A. Wright and Bennie W. Troxel, 1954, 50 pp., 18 figs., 13 route maps.

(m) **Geologic guide no. 2,** Geologic guide through the Ventura basin and adjacent areas, southern California, by Charles W. Jennings and Bennie W. Troxel, 1954, 63 pp., 31 figs., 25 route maps.

(n) **Geologic guide no. 3,** Geologic guide for the Los Angeles basin, southern California, by Bennie W. Troxel, 1954, 46 pp., 34 figs., 11 route maps.

(p) **Geologic guide no. 4,** Geologic guide for the southwestern part of the Los Angeles basin, southern California, by Oroville L. Bandy and Kenneth O. Emery, 1954, 14 pp., 13 figs.

(q) **Geologic guide no. 5,** Geologic guide for the northern part of the Peninsular Range province, southern California, by Richard H. Jahns, 1954 [1955], 59 pp., 27 figs., 11 route maps.

(r) Map sheets 1-34: (1) Geology of Cuyama Valley and adjacent ranges, San Luis Obispo, Santa Barbara, Kern, and Ventura Counties, by Irving T. Schwade, 1954, scale 1″ = 3 mi., approx.; (2) Geology of the Tunis—Pastoria Creek area, Kern County, by Paul B. Harris, 1954, scale 1″ = 5 mi., approx.; (3) Geology of the Sespe Creek—Pine Mountain area, Ventura County, by William R. Merrill, 1954 [1955], scale ½″ = 1 mi.; (4) Geology of the western Ventura basin, Santa Barbara, Ventura, and Los Angeles Counties, by Thomas L. Bailey, 1954 [1955], scale 1″ = 6 mi.; (5) Geology of the eastern Ventura basin, Los Angeles County, by Edward L. Winterer and David L. Durham, 1954 [1955], scale ¾″ = 1 mi.; (6) Geology of the Soledad basin, Los Angeles County, by Richard H. Jahns and William R. Muehlberger, 1954 [1955], scale ¾″ = 1 mi.; (7) Geology of the Ridge Basin area, Los Angeles and Ventura Counties, by John C. Crowell, 1954, scale 1″ = 2½ mi., approx.; (8) Geology of the Santa Monica Mountains, Los Angeles and Ventura Counties, by Cordell Durell, 1954 [1955], scale ½″ = 1 mi.; (9) Geology of the western San Gabriel Mountains, Los Angeles County, by Gordon B. Oakeshott, 1954, scale 1″ = 2 mi.; (10) Geology of the Little Tujunga area, Los Angeles County, by Benjamin F. Howell Jr., 1954, scale 1″ = ½ mi.; (11) Geologic map of the Owens Valley region, California, by Paul C. Bateman, 1954, scale 1:250,000; (12) Geology of the Talc City area, Inyo County, by Thomas E. Gay Jr. and Lauren A. Wright, 1954 [1955], scale 2½″ = 1 mi.; (13) Geology of the Redrock Canyon—Last Chance Canyon area, Kern County, by T. W. Dibblee Jr., 1954, scale 1″ = 1 mi.; (14) Geology of the Rosamond Hills, Kern County, by James A. Noble, 1954, scale 1″ = 1 mi.; (15) Geology of a part of the Shadow Mountains, western San Bernardino County, 1954 [1955], by Bennie W. Troxel, scale 3″ = 1 mi.; (16) Geology of the Quail Mountains, San Bernardino County, by William R. Muehlberger, 1954 [1955], scale ½″ = 2,000′; (17) Geology of the Alexander Hills area, Inyo and San Bernardino Counties, by Lauren A. Wright, 1954, scale ¾″ = 2000′ approx.; (18) Geology of the Barstow area, San Bernardino County, by Oliver E. Bowen Jr., 1954, scale 1″ = 2 mi.; (19) Geology of the Silurian Hills, San Bernardino County, by Donald H. Kupfer, 1954 [1955], scale 11/16″ = 2,000′; (20) Geology of the north side of San Gorgonio Pass, Riverside County, by Clarence R. Allen, 1954 [1955], scale 1″ = 3 mi.; (21) Geology of the Corona-Elsinore-Murrieta area, Riverside County, by Clifton H. Gray Jr., 1954 [1955], scale 1″ = 3 mi.; (22) A typical portion of the southern California batholith, San Diego County, by Richard Merriam, 1954 [1955], scale 1″ = 1 mi.; (23) Geology of the Jacumba area, San Diego and Imperial Counties, by Baylor Brooks and Ellis Roberts, 1954 [1955], scale 1″ = 1 mi.; (24) Geology of a portion of Joshua Tree National Monument, Riverside County, by John J. W. Rogers, 1954, scale ¾″ = 1 mi.; (25) Geology of the Carpinteria district, Santa Barbara County, by Harold M. Liam, 1954 [1955], scale 1″ = 1 mi.; (26) Geology of the Rincon oil field, Ventura County, by Robert H. Paschall, 1954 [1955], scale ½″ = 1,000′; (27) Geology of the San Miguelito oil field, Ventura County, by Richard B. Haines and Francis E. Minshall, 1954, scale 1″ = 1000′ approx.; (28) Geology and occurrences of oil in the Ojai—Santa Paula area, Ventura County, by Spencer F. Fine, 1954, scale 1″ = 1 mi.; (29) Geology of the South Mountain oil field, Ventura County, by E. R. Braddley, 1954 [1955], scale ⅝″ = 1,000′; (30) Geology of the Honor Rancho oil field, Los Angeles County, by Donald G. Herring Jr., 1954, scale 1″ = 1500′; (31) Geology of the Placerita oil field, Los Angeles County, by Gordon B. Oakeshott, 1954, scale 2″ = 1 mi.; (32) Geology of the Dominguez oil field, Los Angeles County, by Doyle T. Graves, 1954, scale 1″ = 1000′; (33) Geology of the Wilmington oil field, Los Angeles County, by Read Winterburn, 1954 [1955], scale ¾″ = 800′; (34) Geology of the Long Beach oil field, Los Angeles County, by Paul H. Dudley, 1954 [1955], scale ⅝″ = 1200′.

The following, included with report, was also distributed separately: Geology of the Los Angeles basin, compiled by A. O. Woodford, J. E. Schoellhamer, J. G. Vedder, and R. F. Yerkes, 1954, scale 2″ = 3 mi., approx.

171. Earthquakes in Kern County California during 1952 (A symposium on the stratigraphy, structural geology, and origin of the earthquakes; their geologic effects; seismologic measurements, application of seismology to petroleum exploration; structural damage and design of earthquake-resistant structures), prepared under the direction of Olaf P. Jenkins, Gordon B. Oakeshott, editor. 1955. 283 pp., 2 pls., 263 figs.

Contains:

(a) **Preface, by Gordon B. Oakeshott, pp. 11-12.**

(b) **Part I, Geology, pp. 13-127, pls. 1-2, 106 figs.:** Introduction, p. 13; 1, The Kern County earthquakes in California's geologic history, by Gordon B. Oakeshott, pp. 15-22, 2 figs.; 2, Geology of the southeastern margin of the San Joaquin Valley, California, by T. W. Dibblee Jr., pp. 23-34, 8 figs.; 3, Kern Canyon lineament, by Robert W. Webb, pp. 35-36, 1 fig.; 4, Nature of movements on active faults in southern California, by Mason L. Hill, pp. 37-40, 2 figs.; 5, Geological effects of the Arvin-Tehachapi earthquake, by John P. Buwalda and Pierre St. Amand, pp. 41-56, 14 figs.; 6, Ground fracture patterns in the southern San Joaquin Valley resulting from the Arvin-Tehachapi earthquake, by Archer H. Warne, pp. 57-66, 20 figs.; 7, Arvin-Tehachapi earthquake damage along the Southern Pacific Railroad near Bealville, California, by Donald H. Kupfer, Siegfried Muessig, George I. Smith, and George N. White, pp. 67-74, 10 figs.; 8, Measurements of earth movements in California, by C. A. Whitten, pp. 75-80, 4 figs.; 9, Effect of Arvin-Tehachapi earthquake on spring and stream flow, by Rovoe C. Briggs and Harold C. Troxell, pp. 81-97, 19 figs.; 10, Water-level fluctuations in wells, by G. H. Davis, G. F. Worts Jr., and H. D. Wilson Jr., pp. 99-106, 3 figs.; 11, Seismic prospecting for petroleum and natural gas in the Great Valley of California, by Joshua L. Soske, pp. 107-118, 15 figs.; 12, Application of seismic methods to petroleum exploration in the San Joaquin Valley, by Maurice Sklar, pp. 119-127, 8 figs.

(c) **Part II, Seismology, pp. 129-210, 50 figs.:** Introduction, p. 129; 1, General introduction to seismology, by H. Benioff and B. Gutenberg, pp. 131-135, 10 figs.; 2, The major earthquakes of California: a historical summary, by V. L. VanderHoof, pp. 137-141; 3, Seismic history in the San Joaquin Valley, by C. F. Richter, pp. 143-146, 1 fig.; 4, Seismograph development in California, by Hugo Benioff, pp. 147-151, 10 figs.; 5, Seismograph stations in California, by B. Gutenberg, pp. 153-165, 2 figs.; 6, Epicenter and origin time of the main shock on July 21 and travel times of major phases, by B. Gutenberg, pp. 157-163, 4 figs.; 7, The first motion in longitudinal and transverse waves of the main shock and the direction of slip, by B. Gutenberg, pp. 165-170, 4 figs.; 8, Magnitude determination for larger Kern County shocks, 1952; effects of station azimuth and calculation methods, by B. Gutenberg, pp. 171-175, 3 figs.; 9, Foreshocks and aftershocks, by C. F. Richter, pp. 177-179, 6 figs.; 10, Mechanism and strain characteristics of the White Wolf fault as indicated by the aftershock sequence, by Hugo Benioff, pp. 199-202, 4 figs.; 11, Relation of the White Wolf fault to the regional tectonic pattern, by Hugo Benioff, pp. 203-204, 2 figs.; 12, Strong-motion records of the Kern County earthquakes, by Frank Neumann and William K. Cloud, pp. 205-210, 4 figs.

(d) **Part III, Structural damage, pp. 211-283, 107 figs.:** Introduction, p. 211; 1, Arvin-Tehachapi earthquake—structural damage as related to geology, by J. Schlocker and Dorothy H. Radbruch, pp. 213-220, 18 figs.; 2, Earthquake damage to oil fields and to the Paloma cycling plant in the San Joaquin Valley, by Robert L. Johnston, pp. 221-225, 9 figs.; 3, Highway damage resulting from the Kern County earthquakes, by O. W. Perry, pp. 227-234, 28 figs. (including Bridge earthquake report, Arvin-Tehachapi earthquake, by Stewart Mitchell, pp. 229-234); 4, Damage to water works systems, Arvin-Tehachapi earthquake, by Harold B. Hemborg, pp. 235-236; 5, Damage to electrical equipment caused by Arvin-Tehachapi earthquake, by G. A. Peers, pp. 237-240, 9 figs.; 6, Earthquake damage to railroads in Tehachapi Pass, pp. 241-248, 22 figs.; 7, Earthquake damage to elevated water tanks, by Karl V. Steinbrugge and

Donald F. Moran, pp. 249-255, 4 figs.; 8, Earthquake damage to California crops, by Karl V. Steinbrugge and Donald F. Moran, pp. 257-258, 4 figs.; 9, Structural damage to buildings, by Karl V. Steinbrugge and Donald F. Moran, pp. 259-270, 10 figs.; 10, The design of structures to resist earthquakes, by G. W. Housner, pp. 271-277, 3 figs.

(e) References cited in Bulletin 171—finding lists, pp. 279-283: References, pp. 281-282; Finding list of authors, pp. 282-283; Finding list of titles, p. 283.

172. Geology and mineral deposits of San Fernando quadrangle, Los Angeles County, California (including anorthosite-gabbro rocks in San Fernando and Tujunga fifteen-minute quadrangles), by Gordon B. Oakeshott. 1958 [1959]. 147 pp., 5 pls., 21 figs., 91 photos., 11 tables.

The following, included in the bulletin, were also distributed separately: Colored geologic map on topographic base of the San Fernando quadrangle, scale 1:62,500; Topographic map of the San Fernando quadrangle with red overprint showing mineral deposits, and structure-section lines, scale 1:62,500.

173. Minerals of California, by Joseph Murdoch and Robert W. Webb. 1st printing, 1956. 2d printing, 1958. 452 pp., 4 figs.

174. Pumice, pumicite, and volcanic cinders in California. 1956. 119 pp., 4 pls., 117 figs.

Contains: Pumice, pumicite, and volcanic cinders in California, by Charles W. Chesterman, pp. 3-97, pls. 1-4, 107 figs.; Technology of pumice, pumicite, and volcanic cinders, by F. Sommer Schmidt, pp. 99-117, 10 figs.; Index, pp. 118-119.

175. Salt in California, by William E. Ver Planck. 1958. 168 pp., 2 pls., 88 figs., frontispiece. (Includes Salt in California Indian culture, by Robert F. Heizer, pp. 101-104, 1 fig.)

176. Mineral commodities of California—geologic occurrence, economic development and utilization of the state's mineral resources. Revision of Bulletin 156. Prepared under the direction of Olaf P. Jenkins, edited by Lauren A. Wright. 1957. 736 pp., 504 figs.

Contains: Preface, by Lauren A. Wright, p. 9; Natural environment of the mineral resources of California, by Olaf P. Jenkins, pp. 11-19, 1 fig.; Abrasives, by Bennie W. Troxel, pp. 23-28; Aluminum, by George B. Cleveland, pp. 29-33, 2 figs.; Antimony, by Harold B. Goldman, pp. 35-44, 11 figs.; Arsenic, by J. Grant Goodwin, pp. 45-48; Asbestos, by Salem J. Rice, pp. 49-58, 7 figs.; Asphalt and bituminous rock, by Charles W. Jennings, pp. 59-70, 10 figs.; Barite, by Charles J. Kundert, pp. 71-74, 4 figs.; Beryllium, by Lauren A. Wright, pp. 75-78, 3 figs.; Bismuth, by Charles W. Chesterman, pp. 79-81, 2 figs.; Black sands, by Melvin C. Stinson, pp. 83-85; Boron, by William E. Ver Planck, pp. 87-94, 4 figs.; Bromine, by William E. Ver Planck, p. 95; Cadmium, by J. Grant Goodwin, pp. 97-98; Calcite (optical grade), by Lauren A. Wright, pp. 99-100, 1 fig.; Calcium chloride, by William E. Ver Planck, pp. 101-104, 3 figs.; Carbon dioxide, by Harold B. Goldman, pp. 105-112, 9 figs.; Cement, by Oliver E. Bowen Jr., pp. 113-120, 7 figs.; Chromite, by Salem J. Rice, pp. 121-130, 8 figs.; Clay, by George B. Cleveland, pp. 131-152, 10 figs.; Coal, by Charles W. Jennings, pp. 153-164, 11 figs.; Cobalt, by Charles W. Chesterman, pp. 165-168, 3 figs.; Copper, by J. C. O'Brien, pp. 169-182, 8 figs.; Diatomite, by Gordon B. Oakeshott, pp. 183-193, 12 figs.; Feldspar, by Lauren A. Wright, pp. 195-200, 4 figs.; Fluorspar, by Charles W. Chesterman, pp. 201-204, 3 figs.; Gem stones, by Lauren A. Wright, pp. 205-214, 5 figs.; Gold, by William B. Clark, pp. 215-226, 11 figs.; Graphite, by Gordon B. Oakeshott, pp. 227-229; Gypsum, by William E. Ver Planck, pp. 231-240, 11 figs.; Iodine, by William E. Ver Planck, pp.

241-243, 2 figs.; Iron industries (iron, steel, ferroalloys, coke, blast furnace slag), by Thomas E. Gay Jr., pp. 245-274, 26 figs.; Kyanite, and alusite, and related minerals, by Lauren A. Wright, pp. 275-280, 6 figs.; Lead, by Richard M. Stewart, pp. 281-292, 7 figs.; Limestone, dolomite, and lime products, by Oliver E. Bowen Jr., pp. 293-306, 11 figs.; Lithium and lithium compounds, by William E. Ver Planck, pp. 307-312, 2 figs.; Magnesium and magnesium compounds, by William E. Ver Planck, pp. 313-323, 7 figs.; Manganese, by Fenelon F. Davis, pp. 325-339, 19 figs.; Mercury, by Fenelon F. Davis, pp. 341-356, 19 figs.; Mica (muscovite, mica schist, vermiculite, and biotite), by Lauren A. Wright, pp. 357-362, 1 fig.; Minor metals [cesium, rubidium, gallium, germanium, indium, rhenium, selenium, thallium], by J. Grant Goodwin, pp. 363-366; Molybdenum, by Richard M. Stewart, pp. 367-371, 2 figs.; Natural gas, by Earl W. Hart, pp. 373-384, 4 figs.; Natural-gas liquids, by Earl W. Hart, pp. 385-390, 3 figs.; Nickel, by Salem J. Rice, pp. 391-399, 5 figs.; Nitrogen compounds, by William E. Ver Planck, pp. 401-408, 4 figs.; Petroleum, by Charles W. Jennings, pp. 409-424, 9 figs.; Phosphates, by Charles J. Kundert, pp. 425-429, 5 figs.; Platinum and allied metals, by William B. Clark, pp. 431-432; Pumice, pumicite, perlite, and volcanic cinders, by Charles W. Chesterman, pp. 433-448, 11 figs.; Pyrites, by Charles W. Chesterman, pp. 449-454, 4 figs.; Pyrophyllite, by Lauren A. Wright, pp. 455-458, 3 figs.; Quartz crystal (electronic grade), by Lauren A. Wright, pp. 459-462, 2 figs.; Quartzite and quartz, by William B. Clark and Denton W. Carlson, pp. 463-466, 1 fig.; Rare earth elements, by Lloyd C. Pray, pp. 467-474, 4 figs.; Salines, by William E. Ver Planck, pp. 475-482, 5 figs.; Salt, by William E. Ver Planck, pp. 483-494, 15 figs.; Sand and gravel, by Thomas E. Gay Jr., pp. 495-520, 28 figs.; Shale, expansible, by B. H. Rogers and Charles W. Chesterman, pp. 521-528, 12 figs.; Silver, by Richard M. Stewart, pp. 529-537, 5 figs.; Sodium carbonate, by William E. Ver Planck, pp. 539-541; Sodium sulfate, by William E. Ver Planck, pp. 543-545, 1 fig.; Specialty sands, by Thomas E. Gay Jr., pp. 547-564, 19 figs.; Stone, crushed and broken, by Thomas E. Gay Jr., pp. 565-590, 21 figs.; Stone, dimension, by Harold B. Goldman, pp. 591-606, 16 figs.; Strontium minerals, by William E. Ver Planck, pp. 607-611, 3 figs.; Sulfur and sulfuric acid, by Philip A. Lydon, pp. 613-622, 8 figs.; Talc and soapstone, by Lauren A. Wright, pp. 623-634, 10 figs.; Thorium, by Bennie W. Troxel, pp. 635-640, 3 figs.; Tin, by Cliffton H. Gray Jr., pp. 641-646, 5 figs.; Titanium, by Philip A. Lydon, pp. 647-654, 5 figs.; Tungsten, by Richard M. Stewart, pp. 655-667, 10 figs.; Uranium, by Bennie W. Troxel, Melvin C. Stinson, and Charles W. Chesterman, pp. 669-687, 12 figs.; Vanadium, by Melvin C. Stinson, pp. 689-692, 2 figs.; Wollastonite, by Bennie W. Troxel, pp. 693-698, 5 figs.; Zinc, by J. C. O'Brien, pp. 699-706, 9 figs.; Zirconium and hafnium, by Melvin C. Stinson, pp. 707-712, 2 figs.; Index, pp. 713-736.

177. Geology and mineral resources of Santa Ysabel quadrangle, San Diego County, California. 1958. 42 pp., pls. 1, 1A, 3 figs., 16 photos.

Contains: Geology of Santa Ysabel quadrangle, San Diego County, California, by Richard Merriam, pp. 7-20, pls. 1, 1A, 2 figs., 11 photos; Mines and mineral resource of Santa Ysabel quadrangle, San Diego County, California, by Richard M. Stewart, pp. 21-38, 1 fig., 5 photos; Reports cited in Bulletin 177, p. 39; Index to Bulletin 177, pp. 41-42.

The following, included with the bulletin, were also distributed separately: Colored geologic map on topographic base of the Santa Ysabel quadrangle, scale 1:62,500; Topographic map of Santa Ysabel quadrangle showing mineral deposits and faults, scale 1:62,500.

178. Geology of the Corona South quadrangle and the Santa Ana Narrows area, Riverside, Orange, and San Bernardino Counties, California, and Mines and mineral deposits of the Corona South quadrangle, Riverside and Orange Counties, California, by Cliffton H. Gray Jr. [In press]

179. Geologic reconnaissance of the northern Coast Ranges and Klamath Mountains, California, with a summary of the mineral resources, by William P. Irwin. 80 pp., 1 pl., 16 figs., 15 photos.

The following, included with the bulletin, was also distributed separately: Plate 1, Geologic map of northwestern California, by William P. Irwin, scale 1:500,000.

180. Sand and gravel in California—an inventory of deposits.

Contains: Part A, Northern California, by Harold B. Goldman. [In press]

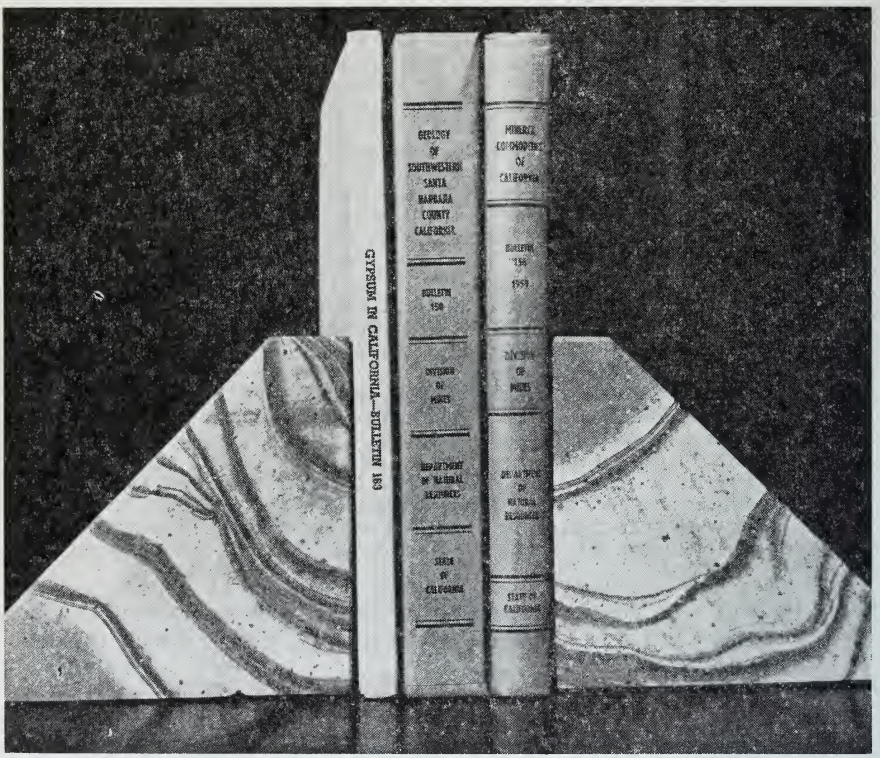

Photo by Mary Hill.

SPECIAL REPORTS (SR)

1A. Sierra Blanca limestone in Santa Barbara County, California, by George W. Walker. 1950. 5 pp., 1 pl.

1B. The Calera limestone in San Mateo and Santa Clara Counties, California, by George W. Walker. 1950. 8 pp., 1 pl., 6 figs.

2. Geology of part of the Delta-Mendota Canal near Tracy, California, by Parry Reiche. 1950. 12 pp., 5 figs.

3. Commercial "Black Granite" of San Diego County, California, by Richard A. Hoppin and L. A. Norman Jr. 1950. 19 pp., 18 figs.

4. Geology of the San Dieguito pyrophyllite area, San Diego County, California, by Richard H. Jahns and John F. Lance. 1950. 32 pp., 2 pls., 21 figs.

5. Geology of the Jurupa Mountains, San Bernardino and Riverside Counties, California. 1951. 14 pp., 1 pl., 14 figs.

6. Geology of Bitterwater Creek area, Kern County, California, by Henry H. Heikkila and George M. MacLeod. 1951. 21 pp., 2 pls., 15 figs.

7A. Gem- and lithium-bearing pegmatites of the Pala district, San Diego County, California, by Richard H. Jahns and Lauren A. Wright. 1st printing, 1951. 2d printing, 1961. 72 pp., 13 pls., 35 figs.

7B. Economic geology of the Rincon pegmatites, San Diego County, California, by John B. Hanley. 1951. 24 pp., 1 pl., 5 figs.

8. Talc deposits of steatite grade, Inyo County, California, by Ben M. Page. 1951. 35 pp., 11 pls., 25 figs.

9. Type Moreno formation and overlying Eocene strata on the west side of the San Joaquin Valley, Fresno and Merced Counties, California, by Max B. Payne. 1951. 29 pp., 5 pls., 11 figs.

10A. Nephrite jade and associated rocks of the Cape San Martin region, Monterey County, California, by R. A. Crippen Jr. 1st printing, 1951. 2d printing, 1951. 3d printing, 1961. 14 pp., 14 figs.

10B. Nephrite in Marin County, California, by Charles W. Chesterman. 1951. 11 pp., 16 figs.

10C. Jadeite of San Benito County, California, by H. S. Yoder and C. W. Chesterman. 1951. 8 pp., 6 figs.

11. Guide to the geology of Pfeiffer Big Sur State Park, Monterey County, California, by Gordon B. Oakeshott. 1951. 16 pp., 1 pl., 28 figs.

12. Hydraulic filling in metal mines, by William Ewart Lightfoot. 1951. 28 pp., 15 figs.

13. Geology of the saline deposits, Bristol Dry Lake, San Bernardino County, California, by Hoyt S. Gale. 1951. 21 pp., 1 pl., 2 figs.

14. Geology of the massive sulfide deposits at Iron Mountain, Shasta County, California, by A. R. Kinkel Jr. and J. P. Albers. 1951. 19 pp., 6 pls., 6 figs.

15. Photogeologic interpretation using photogrammetric dip calculations, by D. H. Elliott. 1952. 21 pp., 9 figs.

16. Geology of the Shasta King mine, Shasta County, California, by A. R. Kinkel Jr. and Wayne E. Hall. 1951. 11 pp., 3 pls., 4 figs.

17. Suggestions for exploration at New Almaden quicksilver mine, California, by Edgar H. Bailey. 1952. 4 pp., 1 pl.

18. Geology of the Whittier—La Habra area, Los Angeles County, California, by Charles J. Kundert. 1952. 22 pp., 3 pls., 19 figs.

19. Geology and ceramic properties of the Ione formation, Buena Vista area, Amador County, California, by Joseph A. Pask and Mort D. Turner. 1952. 39 pp., 4 pls., 24 figs.

20. Geology of the Superior talc area, Death Valley, California, by Lauren A. Wright. 1952. 22 pp., 1 pl., 15 figs.

21. Geology of Burruel Ridge, northwestern Santa Ana Mountains, California, by James F. Richmond. 1952. 16 pp., 1 pl., 11 figs.

22. Geology of Las Trampas Ridge, Berkeley Hills, California, by Cornelius K. Ham. 1952. 26 pp., 2 pls., 20 figs.

23. Exploratory wells drilled outside of oil and gas fields in California to December 31, 1950, by Gordon B. Oakeshott, Lewis T. Braun, Charles W. Jennings, and Ruth Wells. 1952. 77 pp., 1 pl.

    The following, included with the report, was also distributed separately: Outline geologic map of California showing oil and gas fields and drilled areas (Economic mineral map of California no. 2— Oil and gas), scale 1:1,000,000. 2d ed., 1952. [1st ed., 1941, see B118; 3d ed., 1955, see SR 45.]

24. Geology of the Lebec quadrangle, California, by John C. Crowell. 1952. 23 pp., 2 pls., 10 figs.

    The following, included with the report, was also distributed separately: Geologic map of the Lebec quadrangle, California, scale 1:31680; Geologic sections across the Lebec quadrangle.

25. Rocks and structure of the Quartz Spring area, northern Panamint Range, California, by James F. McAllister. 1952. 38 pp., 3 pls., 13 figs.

26. Geology of the southern Ridge Basin, Los Angeles County, California, by Peter Dehlinger. 1952. 11 pp., 1 pl., 7 figs.

    Contains also a section on Economic Geology, by Charles W. Jennings, p. 11.

27. Alkali-aggregate reaction in California concrete aggregates, by Richard Merriam. 1953. 10 pp., 12 figs.

28. Geology of the Mammoth mine, Shasta County, California, by A. R. Kinkel Jr., and Wayne E. Hall. 1952. 15 pp., 9 pls., 5 figs.

29. Geology and ore deposits of the Afterthought mine, Shasta County, California, by John P. Albers. 1953. 18 pp., 6 pls., 9 figs.

30. Geology of the southern part of the Quail quadrangle, California, by Charles W. Jennings. 1953. 18 pp., 2 pls., 16 figs.

31. Geology of the Johnston Grade area, San Bernardino County, California, by Robert B. Guillou. 1953. 18 pp., 1 pl., 19 figs.

32. Geological investigations of strontium deposits in southern California, by Cordell Durrell. 1953. 48 pp., 9 pls., 12 figs.

Contains: Celestite deposits near Ocotillo, San Diego County, California, by Cordell Durrell, pp. 5-7, figs. 1-3; Celestite deposits at Bristol Dry Lake, near Amboy, San Bernardino County, California, by Cordell Durrell, pp. 9-14, figs. 4-6; Celestite deposits near the southern end of Death Valley, San Bernardino County, California, by Cordell Durrell, pp. 15-21, pl. 1, fig. 7; The Solomon and Ross strontianite deposits, Mud Hills, San Bernardino County, California, by Cordell Durrell, pp. 23-36, pls. 2-7, figs. 8-12; Celestite deposits near Ludlow, San Bernardino County, California, by Cordell Durrell, pp. 37-48, pls. 8-9.

33. Geology of the Griffith Park area, Los Angeles County, California, by George J. Neuerburg. 1953. 29 pp., 1 pl., 15 figs.

34. Geology of the Santa Rosa lead mine, Inyo County, California, by Edward M. Mackevett. 1953. 9 pp., 2pls., 3 figs.

35. Tungsten deposits of Madera, Fresno, and Tulare Counties, California, by Konrad B. Krauskopf. 1953. 83 pp., 4 pls., 52 figs.

36. Geology of the Palen Mountains gypsum deposit, Riverside County, California, by Richard A. Hoppin. 1954. 25 pp., 1 pl., 32 figs., frontis.

37. Rosamond uranium prospect, Kern County, California, by George W. Walker. 1st printing, 1953. 2d printing, 1954. 8 pp., 5 figs.

38. Geology of the Silver Lake talc deposits, San Bernardino County, California, by Lauren A. Wright. 1954. 30 pp., 3 pls., 18 figs.

39. Barite deposits near Barstow, San Bernardino County, California, by Cordell Durrell. 1954. 8 pp., 4 pls., 1 fig.

40. Geology of the Calaveritas quadrangle, Calaveras County, California, by Lorin D. Clark. 1955. 23 pp., 1 pl., 7 figs.

The following, included with the report, was also distributed separately: Geologic and economic map of the Calaveritas quadrangle, Calaveras County, California, scale 1:24,000 (lithographed in color on topographic base).

41. Geology of the Angels Camp and Sonora quadrangles, Calaveras and Tuolumne Counties, California, by John H. Eric, Arvid A. Stromquist, and C. Melvin Swinney. 1955. 55 pp., 4 pls., 21 figs.

The following, included with the report, were also distributed separately: Geologic map of the Angels Camp quadrangle, California, scale 1:24,000 (lithographed in color on topographic base); Geologic map of the Sonora quadrangle, California, scale 1:24,000 (lithographed in color on topographic base); Map showing mines and prospects of the Angels Camp quadrangle, California, scale 1:24,000 (on topographic base); Map showing mines and prospects of the Sonora quadrangle, California, scale 1:24,000 (on topographic base).

42. Geology of mineral deposits in the Ubehebe Peak quadrangle, Inyo County, California, by James F. McAllister. 1955. 64 pp., 3 pls., 26 figs.

43. Geology of a portion of the Elsinore fault zone, California, by John F. Mann Jr. 1955. 22 pp., 2 pls., 5 figs.

44. Bibliography of marine geology and oceanography, California coast, by Richard D. Terry. 1955. 131 pp., 2 figs.

45. Exploratory wells drilled outside of oil and gas fields in California to December 31, 1953, by Charles W. Jennings and Earl W. Hart. 1956. 104 pp., 1 map, 1 pl., 2 figs.

The following, included with the report, was also distributed separately: Outline geologic map of California showing oil and gas fields and drilled areas (Economic mineral map of California no. 2—Oil and gas), scale 1:1,000,000, compiled under the direction of Olaf P. Jenkins, by Charles W. Jennings and Earl Hart. 3d ed., 1955. [1st ed., 1941, see B 118; 2d ed., 1952, see SR 23.]

46. Geology of the Huntington Lake area, Fresno County, California, by Warren B. Hamilton. 1956. 25 pp., 1 pl., 16 figs.

47. Economic geology of the Bishop tungsten district, California, by Paul C. Bateman. 1956. 87 pp., 14 pls., 27 figs., 14 photos. (Includes Pine Creek mine, by Paul C. Bateman and Lawson A. Wright, pp. 22-24, 31-34.)

The following, included with the report, were also distributed separately: Colored economic and geologic map on topographic base of Mt. Tom quadrangle, scale 1:62,500; Colored economic and geologic map on topographic base of the Bishop quadrangle, scale 1:62,500; Colored economic and geologic map of the Big Pine quadrangle, scale 1:62,500.

48. Economic geology of the Casa Diablo Mountain quadrangle, California, by C. Dean Rinehart and Donald C. Ross. 1956. 17 pp., 5 pls., 4 figs.

The following, included with the report, was also distributed separately: Colored economic and geologic map of the Casa Diablo Mountain quadrangle, California, scale 1:62,500, on topographic base.

49. Radioactive deposits in California, by George W. Walker, Tom G. Lovering, and Hal G. Stephens. 1956. 38 pp., 6 figs.

50. Plants as a guide to mineralization, by Donald Carlisle and George B. Cleveland. 1958. 31 pp., 10 figs.

51. Economic geology of the Darwin quadrangle, Inyo County, California, by Wayne E. Hall and E. M. Mackevett. 1958. 73 pp., 9 pls., 25 figs., 9 photos., 13 tables. (Includes: Darwin silver-lead district, by W. E. Hall, E. M. Mackevett, and D. L. Davis, pp. 18-41; and Tungsten deposits, by W. E. Hall, E. M. Mackevett, and D. M. Lemmon, pp. 59-66.)

52. Index to geologic maps of California to December 31, 1956, by R. G. Strand, J. B. Koenig, and C. W. Jennings. 1958. 128 pp., 57 maps, 1 fig.

53. Igneous and metamorphic rocks of parts of Sequoia and Kings Canyon National Parks, California, by Donald C. Ross. 1958. 24 pp., 1 pl., 3 figs., 24 photos., 2 tables.

54. Age determination of some granitic rocks in California by the potassium-argon method, by G. H. Curtis, J. F. Evernden, and J. Lipson. 1958. 16 pp., 4 figs.

55. Franciscan chert in California concrete aggregates, by Harold B. Goldman, with a table by Ira E. Klein. 1958. 28 pp., 8 figs., 17 photos, 5 tables, frontispiece.

56. Geology and economic possibilities of the limestone and dolomite deposits of the northern Gabilan Range, California, by Oliver E. Bowen Jr. and Cliffton H. Gray Jr. 1959. 40 pp., 1 pl., 4 figs., 35 photos and frontispiece by Mary Hill.

57. San Francisco earthquakes of March 1957, Gordon B. Oakeshott, editor. 1959. 127 pp., 58 figs., 51 photos, 9 tables, frontispiece.

Contains: Preface, by Gordon B. Oakeshott, p. 5; San Andreas fault in Marin and San Mateo Counties, by Gordon B. Oakeshott, pp. 7-24, 5 figs., 9 photos; Geologic observations in the epicentral area of the San Francisco earthquake of March 22, 1957, by M. B. Bonilla, pp. 25-37, 3

figs., 1 photo, 1 table; Seismic history of the San Francisco region, by Don Tocher, pp. 39-48, 1 fig., 5 photos, 1 table; Intensity and ground motion of the San Francisco earthquake of March 22, 1957, by William K. Cloud, with notes on remeasurement of the triangulation net in the vicinity of San Francisco, by C. A. Whitten, pp. 49-57, 4 figs., 1 table; Seismographic results from the 1957 San Francisco earthquakes, by Don Tocher, pp. 59-71, 4 figs., 4 tables; Damage to buildings and other structures during the earthquake of March 22, 1957, by Karl V. Steinbrugge, Vincent R. Bush, and Edwin G. Zacher, pp. 73-106, 15 figs., 32 photos, 2 tables; Effect of the March 22, 1957 earthquake on public schools, by Manley W. Sahlberg, pp. 107-113, 4 photos; Response spectrum analysis of the San Francisco earthquake of March 22, 1957, by D. E. Hudson and G. W. Housner, pp. 115-123, 26 figs.; References cited in Special Report 57, pp. 125-127.

58. Geology of limestone and dolomite deposits in the southern half of Standard quadrangle, Tuolumne County, California, by Earl W. Hart. 1959. 25 pp., 3 pls., 2 figs., 19 photos, 3 tables.

59. Mineralogy of beach sands between Halfmoon and Monterey Bays, California, by C. Osborne Hutton. 1959. 32 pp., 5 figs., 13 tables.

60. Tertiary volcanic domes near Jackson, California, by Robert L. Rose. 1959. 21 pp., 4 figs., 11 photos, 2 tables, frontispiece.

61. Geological section and petrography along the Poe Tunnel, Butte County, California, by Philip A. Lydon. 1959 [1960]. 18 pp., 1 pl., 4 figs., 15 photos, cover photo.

62. Geology of the Orchard Peak area, California, by Owen T. Marsh. 1959 [1960]. 42 pp., 2 pls., 14 figs., 11 photos, cover photo.

63. Geology and paleontology of the southwest quarter of the Big Bend quadrangle, Shasta County, California, by Albert F. Sanborn. 1960. 26 pp., 2 pls., 5 figs., 12 photos, cover photo.

64. Geology of the Otay bentonite deposit, San Diego County, California, by George B. Cleveland. 1960. 16 pp., 1 pl., 5 figs., 6 photos.

65. Geology of the San Bernardino Mountains north of Big Bear Lake, California. 1960. 68 pp., 1 pl., 72 figs.

    Contains: Geology of the San Bernardino Mountains north of Big Bear Lake, California, by James Frank Richmond, pp. 7-58, 1 pl., 72 figs.; Tabulated list of mines and mineral deposits in an area of the San Bernardino Mountains north of Big Bear Lake, San Bernardino County, California, by Cliffton H. Gray Jr., pp. 59-68.

66. An annotated bibliography of California Cretaceous microfossils, including a brief history of the literature, by Joseph J. Graham. 1961. 43 pp., 2 illus.

67. Geology and mineral deposits of the Colfax and Foresthill quadrangles, California, by Deb K. Chandra. [In press]

68. Igneous and metamorphic rocks of the western portion of Joshua Tree National Monument, Riverside and San Bernardino Counties, California, by John J. W. Rogers. [In press]

69. Clay minerals in the playa sediments of the Mojave Desert, California, by John B. Droste. [In press]

70. Sand and gravel resources of the Kern River near Bakersfield, California, by Harold B. Goldman. [In press]

MINERAL INFORMATION SERVICE (MIS)

Volume 1, numbers 1-12, February-December 1948.

Nos. 1-2, February, 8 pp., 1 chart, contains: Notes on current mining activity in California, pp. 1-2; Zirconium, pp. 3-4; Gypsum, pp. 5-6; California mineral production statistics, 1947, p. 7; Chart, Commercial minerals of California, p. 8. **No. 3, March, 9 pp., contains:** Notes on current mining activity in California, pp. 1-3; List of new publications [received by library], pp. 3-4; Copper, pp. 5-6; Iron, pp. 7-8; New activities at the Brown Bear mine, Trinity County, p. 9. **No. 4, April, 9 pp., contains:** Revision of policy on releasing mineral production by counties, pp. 1-2; James M. Little passes, p. 2; Notes on current mining activity, pp. 2-3; Recent developments in the talc industry, p. 3; Perlite, pp. 3-5; Roofing granules, pp. 5-7; List of recent publications [received by library], pp. 7-8; New talc processing plant, p. 9; New publication [July 1947 *Journal*, Division of Mines], p. 9. **No. 5, May, 9 pp., contains:** Some commodity statistics for 1947, pp. 1-2; New spectrograph and polarograph, p. 2; Mining and industrial news notes, pp. 2-3; Coal, pp. 3-4; Antimony, pp. 5-6; Magnesium, pp. 6-8; List of recent publications [received by library], pp. 8-9. **No. 6, June, 8 pp., contains:** Some commodity statistics for 1947, p. 1; New publications of the Division of Mines [*Journal*, October 1947, January 1948, April 1948], p. 2; Sodium, pp. 3-4; Clay, pp. 5-6; Reference list of recent publications, p. 7; Mining and industrial news notes, p. 8. **No. 7, July, 9 pp., contains:** Mining and industrial news notes, p. 1; New "Minerals of California" [Bulletin 136], p. 2; Domestic uranium production program, p. 2; Lead, pp. 3-4; List of latest complete Division of Mines reports on California counties, pp. 5-6; Selected references to publications on quicksilver in California, pp. 6-8; Mineral resources of Colorado, p. 8; Petroleum, p. 9. **No. 8, August, 9 pp., contains:** Collection and publication of California mineral statistics, p. 1; New publications on chromite in California [Bulletin 134], pp. 1-2; Mineral identification, p. 2; September meeting American Mining Congress, p. 2; San Diego County Fair gem and mineral exhibit, p. 2; Chromite, pp. 3-4; Mica, pp. 5-6; Reference list of recent publications [in Division of Mines library], pp. 7-8; Mining and industrial news notes, p. 9. **No. 9, September, 9 pp., 3 charts, contains:** Mining and industrial news notes, pp. 1-2; New publications of the Division of Mines, [Bulletin 139, July 1948 *Journal*] p. 2; Cobalt, pp. 3-4; Bulletin 129—Iron resources of California, p. 5; Metal mining in California, 1947—final annual figures, p. 5; Chart, Mine production of gold, silver, copper, lead, and zinc in California . . ., p. 6; Chart, Mine production of gold, silver, copper, lead, and zinc in California, 1947 . . ., p. 7; Ore sold or treated in California in 1947 . . ., p. 7. American Mining Congress convention and exposition, p. 8; Reference list of recent publications [in Division of Mines library] pp. 8-9; **No. 10, October, 11 pp., 2 charts, contains:** Commodity statistics for 1947, p. 1; Mining and industrial news notes, pp. 1-2; New publications of the Division of Mines [Bulletin 129, Bulletin 139], p. 2; Beryllium, pp. 3-4; Molybdenum, pp. 5-6; All-division fall meeting of the southern California section of the AIME, p. 6; Reference list of recent publications [in the Division library], p. 7; Chart, Mineral production of California in 1946-47, pp. 8-9; Chart, Clay sold or used by producers in California in 1947, pp. 10-11. **No. 11, November, 8 pp., contains:** Mining and industrial news notes, pp. 1-2; Notes on recent oil and gas developments in California, pp. 2-3; Clay [survey planned] in California, p. 3; Recent gifts to the library of the Division of Mines, p. 4; Nickel, pp. 5-6; Silver, pp. 7-8. **No. 12, December, 8 pp., contains:** Mining and industrial news notes, p. 1; New publications of the Division of Mines [*Journal*, October 1948, Bull. 140], pp. 1-2; New publication on chemical industries of western United States [*Chemical Engineering*], pp. 2-3; Reference list of recent publications [in the Division library], pp. 3-4; Eagle Mountain mine opens, p. 4; Zinc, pp. 5-6; Agricultural minerals and mineral fertilizers, pp. 7-8.

5—39139

Volume 2, numbers 1-12, including supplement, January-December 1949.

No. 1, January, 8 pp., contains: Mining and industrial news notes, p. 1; New distribution center for Division of Mines publications [Redding office], p. 1; The Mother Lode country—geologic guidebook along Highway 49 [Bulletin 141], pp. 1-2; Geology of Tesla quadrangle [Bulletin 140], p. 2; Geology and mineral resources of Alameda County, pp. 2-4; National stock pile program, p. 4; Placerita oil field, p. 4; Feldspar, pp. 5-6; Phosphates, pp. 7-8. **No. 2, February, 24 pp., 6 charts, 1 map, including supplement, bound in), contains:** Mining and industrial news notes, p. 1; Water-flooding as a possible means of increasing California oil production, p. 2; Estimate of California mineral production, 1948, p. 2; Chart, Preliminary figures on mine production of gold, silver, copper, lead and zinc in California in 1948 . . ., p. 3; Chart, Tabulation of total estimated mineral production in California for 1948, p. 3; 77th annual nationwide meeting of the American Institute of Mining and Metallurgical Engineers, p. 4; Guide to airplane trip over the San Francisco Bay area, pp. 4-5; Reference list of recent publications [in the Division library], p. 5; Supplement, Geologic guide—An excursion through the San Francisco Bay area, pp. 6-7; Geologic guide—log of excursion . . . pp. 7-10; The western pulp and paper industry as a consumer of minerals and inorganic chemicals, pp. 10-11, 14; Map, Generalized geologic map and sections, Berkeley Hills—San Andreas rift . . ., pp. 12-13; Chart, Annual production of material used in the paper industry, p. 14; Chart, Mineral production of California in 1947, p. 15; Chart, Mineral production in 1947, by counties, pp. 15-24. **No. 3, March, 8 pp., 4 charts, contains:** Mining and industrial news notes, p. 1; New publications of the Division of Mines [1948 Journals, bound; January 1949 *Journal*; Bulletin 141, 2d printing], pp. 1-2; Alpine County, pp. 3-4; The western paint and varnish industry as a consumer of chemicals, pp. 4-6, including 4 charts; Bismuth, pp. 7-8. **No. 4, April, 8 pp., 1 chart, contains:** California Division of Mines requests names and addresses of new mineral producers, p. 1; Mining and industrial news notes, pp. 1-3; The mineral needs and mineral problems of the ceramic industry, by H. R. Goodrich, pp. 3-5; Annual meeting of the Association of American State Geologists, p. 5; National meeting of the American Institute of Mining and Metallurgical Engineers, pp. 5-6; Rock-color chart, p. 6; Amador County, pp. 6-7, including 1 chart; Reference list of recent publications [in the Division library], p. 8. **No. 5, May, 8 pp., 1 chart, contains:** Mining and industrial news notes, p. 1; Gypsum in California—its occurrence and uses, pp. 2-4; Talc, pp. 5-6; Butte County, pp. 7-8, including 1 chart; Reference list of recent publications [in the Division library], p. 8. **No. 6, June, 8 pp., 1 chart, contains:** New publications of the Division of Mines [Bulletins 141 (2d printing), 144; April 1949 *Journal*], pp. 1-2; Mining and industrial news notes, p. 2; Materials of mineral origin used in the rubber industry, by Erle C. Zimmerman, pp. 3-4; Calaveras County, pp. 4-6, including 1 chart; Mineral pigments, pp. 7-8. **No. 7, July, 7 pp., 1 chart, contains:** New publications of the Division of Mines [List of available publications], p. 1; Mining and industrial news notes, pp. 1-2; Topographic map index, p. 2; Reference list of recent publications [in the Division library], p. 2; Alum and alum minerals, pp. 3-4; The history of the American Smelting and Refining Company, p. 5; Mineral needs and problems of the fertilizer industry, by Oliver E. Overseth, pp. 5-6; Colusa County, p. 7, including 1 chart; New mineral display, p. 7. **No. 8, August, 12 pp., 2 charts, contains:** Gallium, p. 1; Contra Costa County, pp. 2-3, including 1 chart; Increased usefulness of topographic mapping, p. 4; Uranium, pp. 5-6; Mining and industrial news notes, p. 7; Reference list of recent publications [in the Division library], p. 7; Chart, Mine production of gold, silver, copper, lead, and zinc in California, 1948 . . ., pp. 8-9; New publications of the Division of Mines [Bulletins 123 (reprint), 142, 118 (reprint), July 1949 *Journal*], pp. 10-12. **No. 9, September, 8 pp., 3 charts, contains:** Mineral needs of the glass container industry in California, by Richard L. Cheney, pp. 1-2, including 1 chart; Iodine, pp. 3-4, including 1 chart; Del Norte County, p. 5, including 1

chart; New United States Geological Survey publications, p. 6; Borates, pp. 7-8. **No. 10, October, 12 pp., 2 charts, 1 map, 1 illus., contains:** Fall meeting, Southern Section, A.I.M.E., p. 1; American Mining Congress convention, p. 1; Annual meeting Geological Society of America, p. 1; Pacific Chemical Exposition, p. 1; El Dorado County, pp. 2-4, including 1 chart; Course in ceramic engineering fundamentals . . ., p. 4; Mining and industrial news notes, p. 5; Ferro-alloys, pp. 6-8; Reference list of recent publications [in the Division library], pp. 8-9; Production and utilization of petroleum in California . . . 1949 (and) . . . 1948, p. 10, including 1 chart, illus., Pacific Minerals Company slate quarry, p. 10; Map, Distribution of principal mineral resources, p. 11; Economic mineral map series, p. 12. **No. 11, November, 8 pp., 2 illus., contains:** Fall meeting American Association of Petroleum Geologists, p. 1; Mining and industrial news notes, p. 1; Lead, pp. 2-3; Chromium, pp. 4-6; Reference list of recent publications [in the Division library], p. 6; Illus., Western Refractories Company's Solari pit . . ., p. 7; Illus., . . . Pacific Clay products Company's Dosch pit . . ., p. 7; Quadrangle geologic map series, p. 8. **No. 12, December, 8 pp., contains:** Mining and industrial news notes, p. 1; Two new color movies added to Division library, p. 1; Quartz, pp. 2-4; Reference list of recent publications [in the Division library], p. 4; Index to *Mineral Information Service*, vols. 1 and 2, pp. 5-6; Division of Mines Publications [October 1949 *Journal; The Elephant as They Saw It*], p. 7.

Volume 3, numbers 1-12, January-December 1950.

No. 1, January, 24 pp., 4 charts, 1 illus., contains: Mining and industrial news notes, pp. 1-3; The counties of California [Bulletin 142], p. 3; New report on New Almaden quicksilver district [U.S.G.S.] p. 3; California mines use mill tailings for filling, p. 4; Can you help us? [serials needed for Library], p. 5; Mineral needs and problems of the petroleum industry, by P. H. Faust and N. R. Gutschow, pp. 6-8; Illus., Fouch-Thompson pumice pit . . ., p. 8; Chart, California topographic maps, p. 9; Chart, Quantity and value of mineral substances produced in California during 1946-1947, and 1948, pp. 10-11; Chart, Value of mineral production of California in 1947-48 . . ., p. 12; Chart, Mineral production of California in 1947-1948, by counties, pp. 12-23. **No. 2, February, 12 pp., 3 charts, contains:** Division of Mines open house, p. 1; Chart, California topographic maps, p. 1; Pyrophyllite, pp. 2-3; Manganese, pp. 3-5; Chart, Mine production of gold, silver, copper, lead, and zinc in California in 1949 . . ., p. 6; Chart, Mine production of gold, silver, copper, lead, and zinc in California, 1945-1949 . . ., p. 6; Gold, pp. 7-8; Reference list of recent publications [in the Division library], pp. 8-9; Recommendations of the Governor's Conference on Employment, p. 9; Pine Creek tungsten mine, p. 10; Acknowledgment, p. 11. **No. 3, March, 12 pp., 3 charts, 1 illus., contains:** Seventy years of progress, p. 1; Estimate of California mineral production 1949, p. 2; Chart, Tabulation of estimated mineral production in California for 1949, p. 2; Monazite and the rare-earth elements, pp. 3-4; Production and utilization of petroleum in California for 1949 compared with 1948, p. 5; Chart, Production of petroleum products . . ., p. 5; Geologic map indexes available, p. 5; Chart, California topographic maps, p. 6; New film added to library, p. 6; Zirconium, pp. 7-9; Acknowledgment, p. 9; Reference list of recent publications [in the Division library], p. 10; Mining and industrial news notes, p. 11; Redding office moved, p. 11; Illus., Mining pumicite at Shoshone . . ., p. 11; New publication [January 1950 *Journal*], p. 12. **No. 4, April, 12 pp., 2 charts, 2 illus., contains:** Division of Mines open house, p. 1, including illus.; Industrial Minerals Division meeting—A.I.M.E., p. 2; Discovery of jadeite in California, pp. 2-3; The California chlorine-caustic industry, pp. 3-5; California history subject of new film, p. 5; Chart, California topographic maps; pp. 5-6; Publications of the Division of Mines [Bulletin 142, 130; *Manner of Locating and Holding Mineral Claims in California*], p. 6; Gem minerals, pp. 7-9, including chart; Mining and industrial news notes, p. 9; Reference list of recent publications [in the Division library], p. 10; Acknowledgments, p. 10; *The elephant as they saw it*, p. 11, including illus.; Inventory of mines and mineral resources of the counties Tuolumne, Kern, Butte, and Son-

oma, p. 12. **No. 5, May, 12 pp., 2 charts, 1 illus., contains:** In memoriam, Walter W. Bradley, p. 1; Post-war developments and conditions in the California cement industry, pp. 2-4; Fluorite, p. 6; Mining and industrial news notes, pp. 6-7; Chart, California topographic maps, pp. 7-8; Reference list of recent publications [in the Division library], p. 8; California sand-blasting materials, pp. 9-11, including 1 chart; Illus., Russel Ranch oil field . . ., p. 11; Bulletin 149 . . ., p. 12. **No. 6, June, 8 pp., contains:** Mineral display at Redding, p. 1; Tungsten, pp. 1-3; Sulfur, pp. 4-6; New publications of the Division of Mines [April 1950 *Journal;* Bulletin 135 (reprint); Bulletin 147], pp. 7-8. **No. 7, July, 20 pp., 2 charts, contains:** Assessment work, p. 1; Mining and industrial news notes, pp. 2-3; New publications of the Division of Mines [Bulletin 151, 152], p. 3; Chart, Mine production by counties, pp. 4-5; Chart, Mine production by counties, p. 6; Abrasives, pp. 7-12; Price list of available publications of the California State Division of Mines, pp. 12-19. **No. 8, August, 8 pp., 1 illus., contains:** Assessment work, pp. 1-2; Mining and industrial news notes, pp. 2-4, including illus.; Acknowledgment [publications received by Library], pp. 4-5; Cobalt, pp. 5-7; Reports on strategic minerals recently issued by the Division of Mines, pp. 7-8. **No. 9, September, 8 pp., 1 chart, contains:** Sacramento office in new location, p. 1; September meeting of the Mining Branch, Southern California Section, American Institute of Mining and Metallurgical Engineers, p. 1; New publications of the Division of Mines [Bulletin 156; July 1950 *Journal*], pp. 1-2; Strategic Minerals in California and the stockpiling program, pp. 2-3; Institution of Mining and Metallurgy abstracts, p. 4; Chart, California topographic maps, p. 4; Mining and industrial news notes, pp. 5-8; Publications on mining law, p. 8. **No. 10, October, 8 pp., 2 charts, contains:** In memoriam, Charles V. Averill, p. 1; Mining and industrial news notes, p. 2; Sources of information on strategic minerals, pp. 2-5, including 2 charts; Reference list of recent publications [in the Division library], pp. 6-7; Mineral commodities of California [Bulletin 156] . . ., p. 7. **No. 11, November, 8 pp., 1 chart, 1 map. 1 illus., contains:** U.S. Department of Interior Minerals and Energy Administration, p. 1; Mining and industrial news notes, pp. 1-2; Mercury, pp. 2-4; Reference list of recent publications [in the Division library], pp. 4-5; Recent gifts to the Division of Mines library, p. 5; Chart, California topographic maps, p. 5; Map, Index to quadrangles, p. 6; New publications of the Division of Mines [October 1950, *Journal*], p. 7; Illus., Dredge of Chowchilla Dredging Company . . ., p. 7. **No. 12, December, 8 pp., 2 charts, contains:** Loans for developing strategic mineral deposits, p. 1; Mining labor and the draft, p. 1; California's mineral position in a changing industrial world, pp. 1-2; Chart, Correction for strategic mineral tables, p. 2; Recent gifts to the Los Angeles library of the Division of Mines, p. 2; Mining and industrial news notes, pp. 2-3; Chart, California topographic maps, pp. 3-4; Salt, soda ash, and salt cake, pp. 4-6; Reference list of recent publications, pp. 6-7; Recent additions to the San Francisco library of the Division of Mines, p. 7; Geology of part of the Delta-Mendota Canal [Special Report 2], p. 7.

Volume 4, numbers 1-12, January-December 1951.

No. 1, January, 8 pp., contains: The need for marketing information on California minerals, pp. 1-2; Higher tariff rates on tungsten and antimony, p. 2; Report on New Almaden quicksilver possibilities, p. 2; Mining and industrial news notes, pp. 2-3; Mineral needs and problems of the bituminous base roofing industry, by Dozier Finley, pp. 3-5; New publications of the Division of Mines [Special Reports 1A, 2], pp. 5-6; Index to *Mineral Information Service*, pp. 6-7. **No. 2, February, 16 pp., 3 charts, contains:** Mining and industrial news notes, p. 1; Chart, Mineral production in California during 1949, p. 2; Chart, Value of mineral production of California in 1948-49 . . ., p. 3; Chart, Mineral production of California in 1948-49 . . ., pp. 3-16; New publications [Special Reports 1B, 3, 4], p. 16. **No. 3, March, 8 pp., 1 chart, 1 illus., contains:** Mining and industrial news notes, pp. 1-2; Lithium, pp. 2-3; Recent announcements of the Defense Minerals Administration, pp. 3-4; Titanium metal specimens donated to the Museum, p. 4; New publications of the State Division of Mines [Special Reports 1B, 3, 4; January 1951 *Jour-*

nal], pp. 4-5; New mineral hall at the California State Exposition, p. 6, including 1 illus.; *Mineral Commodities of California* [Bulletin 156], p. 6; Rock and mineral sets for California schools, p. 7; Preliminary report on metal mining in California during 1950, including 1 chart, p. 7; Mineral marketing information, pp. 7-8. **No. 4, April, 8 pp., 5 charts, contains:** Mining and industrial news notes, including 2 charts, pp. 1-2; The perlite industry in the Los Angeles area, including 2 charts, pp. 3-5; New publications of the State Division of Mines [Bulletin 150; Special Report 5], pp. 5-6; Chart, California topographic maps, pp. 6-7; Mineral marketing information, pp. 7-8. **No. 5, May, 8 pp., 2 charts, contains:** Niobium and tantalum in modern industry, pp. 1-3; Mineral exploration program regulations issued by DMA, pp. 3-4; Atomic Energy Commission announces new uranium bonus, p. 4; Mineral marketing information, p. 4; Production and utilization of petroleum in California during 1950, including 1 chart, p. 5; Oil well depth records in the United States, including 1 chart, pp. 5-6; Reference list of recent publications, pp. 6-7; Two new publications issued by the Division of Mines [Special Report 6; Bulletin 134], p. 7. **No. 6, June, 8 pp., 3 charts, contains:** Asbestos, including 1 chart, pp. 1-2; Manganese mining in San Joaquin County, p. 2; Mining and industrial news notes, p. 2; Mercury mining in Mayacmas district, p. 3; Reference list of recent publications, p. 3; Chart, Commercial minerals of California, p. 4; Chart, California topographic maps, p. 5; Carbon dioxide production in California, p. 5; Mineral marketing information, p. 6; Gem and mineral show in Oakland, p. 6; Guaranteed price for tungsten, p. 6; Serialization order issued by DMA, p. 6; Unpublished reports on open file, p. 6; Publications on uranium prospecting, p. 6; Two new quadrangle studies issued [Bulletins 148, 153], p. 7; Other quadrangle reports available [Bulletins 150, 149, et al.], p. 7. **No. 7, July, 8 pp., 1 chart, contains:** Fluorescence of minerals, pp. 1-2; Use of the term niobium, p. 2; Mineral marketing information, p. 2; Chart, California topographic maps, p. 3; Reference list of recent publications [in the Division library], p. 3; Price list of available publications, pp. 4-7; New publications of the Division of Mines [April, July 1951 *Journals;* Bulletins 155, 157], p. 7. **No. 8, August, 8 pp., 4 charts, contains:** Black sands, pp. 1-2; Mining and industrial news notes, p. 3; New report on jade published [Special Report 10A], p. 3; Chart, Mine production of gold, p. 4; Chart, Mine production of silver, p. 4; Chart, Mine production of copper, lead, zinc, p. 5; Chart, California topographic maps, p. 5; Jade, p. 6; Mineral marketing information, pp. 6-7; New publications of the Division of Mines [Bulletin 136; October 1949, July 1944, July 1943 *Journals*], p. 7; Oakland mineral and gem show, p. 7. **No. 9, September, 8 pp., 2 charts, 1 map, 2 illus., contains:** Petroleum, including 2 illus. and 1 map, pp. 1-3; Comprehensive petroleum bulletin [118] available, p. 3; Rinconada mine reopened, p. 3; Daulton copper mine, p. 3; Zirconium metal specimens donated to Museum, p. 4; Tungsten purchase deadline extended, p. 4; Tungsten found in Coast Ranges, p. 4; 2 charts, California topographic maps, p. 5; GSA announces manganese program, p. 5; Mineral marketing information, p. 6; Tariff rates on minerals cut by Torquay Pact, p. 6; New shaded relief map [Bulletin 158], p. 7; Unpublished report on open file, p. 7; New jade reports issued [Special Reports 10A, 10B, 10C], p. 7; Price correction [October 1949 *Journal*], p. 7. **No. 10, October, 8 pp., 4 illus., 1 map, 1 chart, contains:** Obsidian, including 4 illus., 1 map, pp. 1-4 (reprinted separately, 1960); Fall meeting, Southern Section, AIME, p. 4; Fall meeting, California Chamber of Commerce, p. 4; American Mining Congress convention, p. 4; American Ceramic Society regional meeting, p. 4; Chart, California topographic maps, p. 5; GSA announces chrome purchase program, p. 5; Inyo County asbestos deposit purchased, p. 5; New San Bernardino County lime operation, p. 6; Exploration for tungsten, p. 6; San Bernardino County Fair, p. 6; Andalusite, p. 6; Los Angeles mineral market survey, p. 6; Mineral commodity survey, a review [tungsten], p. 6; New Special Report on critical mineral [Special Report 8], p. 7; Pfeiffer Big Sur State Park [Special Report 11], p. 7; Gem bearing area described [Special Report 7B], p. 7. **No. 11, November, 8 pp., 3 charts, contains:** Mineral filler, including 1 chart, pp. 1-3; Mineral notes and news, p. 2;

Chart, California topographic maps, p. 4; Tyson chromite mine producing, p. 4; Molybdenum, p. 4; New exploration projects approved by DMA, p. 4; Mineral marketing information, p. 5; Geneva Steel Company manganese purchasing program, p. 5; Bound copies of *Journal* [1950], available, p. 6; Jade report to be reprinted [Special Report 10A], p. 6; Barit, p. 6; Production and utilization of petroleum, p. 6; Reports on southern California [Bulletin 159], p. 6; New report on gem-bearing area released [Special Report 7A], p. 7; Mineral reference book [Bulletin 136], p. 7; Bulletin on southwestern California [Bulletin 159], p. 7. **No. 12, December, 8 pp., 1 chart, contains:** California mineral fillers, pp. 1-3; Tungsten purchase program, p. 3; Quicksilver mines consolidated, p. 3; Mineral marketing information, p. 4; Contra Costa County and fluorspar subjects in new quarterly *Journals* [October 1951], p. 4; Index to *Mineral Information Service*, vol. 4, pp. 5-6; Chart, California topographic maps, p. 6; Mining and Industrial news notes, p. 6; Three new Special Reports, [9, 13, 14] released, p. 7; Jade report reprinted [Special Report 10A], p. 7; New chromite chapter [Bulletin 134], p. 7.

Volume 5, numbers 1-12, January-December 1952.

No. 1, January, 8 pp., 1 map, contains: California quicksilver mining during 1951, including 1 map, pp. 1-6; Clay industries conference, p. 7; Hydraulic filling report issued [Special Report 12], p. 7; New guidebook available [Bulletin 154], p. 7. **No. 2, February, 8 pp., 10 illus., 1 chart, contains:** San Francisco Bay area issue [Bulletin 154], including 10 illus., pp. 1-5; Salt industry of the bay area, p. 5; Bay area mineral utilization survey, p. 5; Rock and mineral sets, p. 5; Chart, California topographic maps, p. 6; Geologic maps in the San Francisco Bay counties, p. 6; Mineral marketing information, p. 7; California nepheline syenite, p. 7; New index map issued [Geologic map index of California], p. 7. **No. 3, March, 12 pp. 2 maps, 2 charts, 1 illus., contains:** Outline of stratigraphic record of California, including 1 illus., 2 maps, 1 chart, pp. 1-8; Chart, Commercial assay and testing laboratories, pp. 9-10; New Special Reports [15, 16], p. 11; New issue of *Journal* [January 1952; 1951 volume], p. 11. **No. 4, April, 8 pp., 1 illus., 2 charts, contains:** Cement copper, including 1 illus., pp. 1-3 (reprinted separately, 1960); Synthetic zeolite plant in San Bernardino, p. 3; A resume of California's oil production and drilling activity during 1951, pp. 3-4; Mining and industrial news notes, p. 4; Molybdenum in tungsten ores, p. 4; Meeting of the Cordilleran Section of the Geological Society of America, p. 4; Fifth Empire Mining and Metallurgical Congress, 1953, pp. 4-5; Land open to mineral location, p. 5; Mineral marketing information, pp. 5-6; Chart, California topographic maps, p. 6; New ore possibilities described [Special Report 17], p. 7; Recent library additions, p. 7; Chart, Supplementary list of assayers, p. 7. **No. 5, May, 8 pp., 1 map, 1 illus., 1 chart, contains:** Copper, including 1 illus., 1 map, pp. 1-4; Chart, California topographic maps, p. 5; Recent developments in the California cement industry, pp. 5-6; New geologic maps of bastnasite deposits on open file, p. 6; Building materials, Yuba County featured [April 1952 *Journal Fábricas*], p. 7; Whittier-La Habra area studied [Special Report 18] p. 7; Mineral marketing information, p. 7. **No. 6, June, 12 pp., 7 illus., 1 map, 2 charts, contains:** Use of fossils in geologic exploration, including 1 map, 2 illus., 1 chart, pp. 1-3 (reprinted separately, 1960); Chart, California topographic maps, p. 4; Mining and industrial news notes, p. 4; Price list of available publications, pp. 5-8; 16mm. films available, p. 8; Translation of French article [U.S.G.S. open file], p. 8; Mineral marketing information, p. 8; Mineral societies meeting, p. 9; National conference on clay, p. 9; Clark Mountain gypsum area, p. 9; New oil discovery, p. 9; Wollastonite, p. 9; *Fábricas*, including 5 illus., pp. 10-11; Yuba County report [April 1952 *Journal*], p. 11; Healdsburg quadrangle studied [Bulletin 161], p. 11; Chromite report available [Bulletin 134], p. 11. **No. 7, July, 16 pp., 5 charts, 6 illus., contains:** Adsorbent clay, pp. 1-2; California mineral production, 1950, including 3 charts, pp. 3-8; Chart, California topographic maps, p. 8; Mountain Pass rare earth operations, p. 9; Mining and industrial news notes, p. 10; Manganese operation in Riverside County, p. 10, 1

illus.; Production and utilization of petroleum in California during 1951, p. 10, 1 chart; National clay conference, p. 11; Clay in California, pp. 12-13, 2 illus.; Clay research as an aid to industry, by Joseph A. Pask, pp. 13-15, 3 illus.; Mineral marketing information, p. 15; Supplement to MIS [Legal guide], p. 15; Study of Ione clay [Special Report 19], p. 15. Supplement (issued separately): *Legal guide for California prospectors and miners*, compiled under the direction of L. A. Norman Jr., prepared as a supplement to Mineral Information Service, vol. 5, no. 7, July 1952; 1st printing, August 1952; 2d printing, August 1953; 3d printing, December 1954; 4th printing, May 1955; 5th printing, August 1955; 78 pp., 3 figs. **No. 8, August, 8 pp., 2 charts, contains:** Boron compounds, pp. 1-3; Man-made island to be drilling site, p. 3; July *Journal* available, p. 3; Chart, mine production of gold, silver, copper, lead and zinc in California in 1950 and 1951 . . ., pp. 4-5; Chart, California topographic maps, p. 5; Reference on rare earth in California, p. 6; Ceramic education in California, by Joseph A. Pask, p. 7; Clay area studied [Special Report 19], p. 7; New reference volumes [I.G.C. Proceedings], p. 7. **No. 9, September, 5 illus., 2 maps, 1 chart, contains:** Arvin-Tehachapi earthquake, including 4 illus., 2 maps, pp. 1-4; The Arvin earthquake of July 21, 1952, by Hugo Benioff, John P. Buwalda, Beno Gutenberg, and Charles Richter, including 1 chart, 1 illus., pp. 4-7; New government manganese purchase program [G.S.A.], p. 7; Mineral production in California during 1951, p. 7; Reference list of new publications [U.S. Bureau of Mines], p. 7. **No. 10, October, 8 pp., 3 charts, contains:** Minerals in the glass industry, including 2 charts, pp. 1-3; Mineral marketing information, p. 3; Price list of available publications, pp. 4-7; Chart, Defense minerals exploration projects [U.S. Bureau of Mines], p. 7; New reports in library, p. 7; Mica, p. 7. **No. 11, November, 8 pp., 4 illus., contains:** Geophysical prospecting, including 4 illus., pp. 1-4; Mineral marketing information, p. 5; Death Valley area studied [Special Report 25], p. 5; October *Journal* issued, p. 6; Sebastopol quadrangle mapped [Bulletin 162], p. 6; Prospectors guide released, p. 7; New oil map [Special Report 23], p. 7; Lebec quadrangle published [Special Report 24], p. 7; Talc report [Special Report 20], p. 7; Germanium, p. 7. **No. 12, December, 8 pp., 1 chart, contains:** Beryllium, pp. 1-2; GSA beryl program, p. 3; Quicksilver mining during 1952, pp. 3-4; Tungsten mining, p. 4; Tungsten mills in California, p. 5; Tungsten mills concentrating own ore, p. 5; Tungsten mills purchasing low-grade ores, p. 5; Tungsten mills concentrating low-grade ore, p. 5; Tungsten custom mills reconcentrating low-grade concentrates, p. 5; Tungsten concentrate buyers, p. 5; Salt in 1951, p. 5; Chart, California topographic maps, p. 6; Supplement to *Minerals of California*, p. 7; New gypsum bulletin [Bulletin 163], p. 7; Las Trampas Ridge mapped [Special Report 22], p. 7; Part of Santa Ana Mountains mapped [Special Report 21], p. 7; Mother Lode guidebook sold out [Bulletin 141], p. 7; Ridge Basin studies [Special Reports 24, 26], p. 7.

Volume 6, numbers 1-12, January-December 1953.

No. 1, January, 8 pp., 4 illus., 2 charts, contains: Anhydrite, including 1 illus., pp. 1-2; Division of Mines museum, including 3 illus., pp. 3-4; Exhibit of Crestmore minerals, p. 4; Chart, Employment in the mineral extraction industry, p. 5; Chart, California topographic maps, p. 6; Mineral marketing information, p. 6; Index to *Mineral Information Service*, Vol. 5, p. 7. **No. 2, February, 8 pp., 3 illus., 2 maps, 2 charts; Supplement 8 pp., 4 illus., 3 maps, contains:** Topographic maps, including 2 maps, 3 illus., pp. 1-5; Chart, California topographic maps, pp. 6-7; Preliminary report on metal mining in California during 1952, including 1 chart, p. 7; New report on Shasta County mine [Special Report 28], p. 8. Supplement (issued separately): *Geologic log for Ventura Basin field trip: Los Angeles to Wheeler Springs and return via coast route*: Meeting of Association of America State Geologists, Los Angeles, February 12-14, 1953; 8 pp., 7 illus. **No. 3, March, 8 pp., 2 illus., 2 charts, contains:** Geochemical prospecting, including 2 illus., 1 chart, pp. 1-5; Forest

products used in California mines, p. 5; Chrome ore custom mill near San Jose, p. 5; Mineral marketing information, p. 6; New guide book [Ventura Basin] released, p. 6; New report on aggregate [Special Report 27], p. 6; Chart, California topographic maps, p. 7. **No. 4, April, 12 pp., 4 illus., 1 map, 10 charts, contains:** Serpentine in California, including 2 illus., 1 map, pp. 1-4; Trend of the mineral industry of California, by Olaf P. Jenkins, including 8 charts, pp. 5-8; Glaucophane rock used for breakwater construction in Humboldt Bay, p. 8; Glaucophane schist in California, p. 8; Mineral marketing information, p. 9; Price control lifted [OPS], p. 9; Columbium (niobium) and tantalum, p. 9; Chart, 1952 production and utilization of California's petroleum, p. 10; Chart, California topographic maps, p. 10; Panoramic relief model of California, including 2 illus., p. 11; Gem minerals in serpentine [Special Reports 10A, 10B, 10C], p. 11; Boron steel, p. 11. **No. 5, May, 8 pp., 10 illus., 1 chart, contains:** Gold in California, including 6 illus., 1 chart, pp. 1-6; School visitors, including 4 illus., p. 7. **No. 6, June, 8 pp., contains:** Location and assessment work, pp. 1-5; Production of glazed wall tile in southern California, pp. 5-6; Discovery of perlite in San Benito County, p. 6; Gem and lapidary show, p. 6; New report on Shasta County mine [Special Report 29], p. 7; Part of Quail quadrangle mapped [Special Report 30], p. 7; San Bernardino County report now ready [January-April 1953 *Journal*], p. 7. **No. 7, July, 12 pp., 5 illus., 1 chart; supplement, 78 pp., 3 figs., contains:** Volcanic rocks, including 5 illus., pp. 1-5; Revised DMEA program, p. 5; Mining news and notes, p. 5; Chart, perlite processing plants in the Los Angeles area, p. 6; Price list of available publications, pp. 7-10; *Mineral Information Service* [mineral markets], p. 10; New quadrangle bulletin [Bulletin 160], p. 11; New map series [Library accessions], p. 11; Correction [rediscovery of gold-bearing quartz], p. 11; New chromite chapter [Bulletin 134], p. 11. Supplement (issued separately): *Legal guide for California prospectors and miners,* 78 pp., 3 figs.; 1st printing, 1953; 2d printing, 1953. **No. 8, August, 12 pp., 12 illus., 2 charts, contains:** New book tells origin of California's landscape [Bulletin 158], including 4 illus., pp. 1-2; Equipment for small-scale gold placer mining, including 8 illus., pp. 1, 4-9; Manganese mining in southern California, p. 3; New inquiries office, p. 3; Back issues of M.I.S. available, p. 3; Santa Rosa lead mine described [Special Report 34], p. 9; Southern California strontium deposits [Special Report 32], p. 9; Gold books prove popular [Elephant, Bulletin 141, Legal Guide], p. 9; Chart, Mine production of gold, silver, copper, lead and zinc in California in 1952 . . ., p. 10; Chart, California topographic maps, p. 11. **No. 9, September, 8 pp., 4 illus., 1 chart, contains:** Lithium compounds, including 4 illus., pp. 1-6; California's lithium gems, p. 6; Chart, California topographic maps, p. 7; San Francisco mineral fair, p. 7; Price corrections, p. 7. **No. 10, October, 16 pp., 9 illus., 1 map, 4 charts, contains:** Clay in Los Angeles County, including 3 illus., pp. 1-4; Newly opened clay deposit, by George Lunetta, including 2 illus., 1 map, pp. 4-6; Record year for kaolin and fire clay in 1951, p. 6; Cement in 1952, p. 6; Tungsten in 1952, pp. 6, 13; Chart, California mineral production, 1951, pp. 7-12; Chart, Mineral marketing information, p. 12; Chart, California topographic maps, p. 13; Molybdenum market, p. 13; Ceramic kilns, including 4 illus., pp. 14-15. **No. 11, November, 8 pp., 5 illus., 1 chart, contains:** Diatomite, by P. W. Leppla, including 5 illus., pp. 1-3; Diatomite deposits in California, pp. 4-5; Chart, California diatomite operations in 1952, p. 5; Mineral marketing informating, p. 6; New library gift, p. 6; Synthetic mica, p. 6; Borax, p. 6; Mother Lode guidebook reprinted [Bulletin 141], p. 7; Uranium prospect described [Special Report 37], p. 7; Selenium and tellurium, p. 7. **No. 12, December, 8 pp., 4 illus., 3 charts, contains:** Manganese in California, including 3 illus., pp. 1-4, 7; Chart, California topographic maps, p. 5; Chart, common manganese minerals, p. 5; Chart, California manganese production by counties, p. 6; Leviathan sulfur mine, p. 6; Garnet Hill Tungsten mine, pp. 6-7; Petroleum production and utilization, 1953, p. 7; Mount Diablo quicksilver mine, including 1 illus., p. 7; Talc, pyrophyllite, and soapstone production, 1952, p. 7; New report on Griffith Park [Special Report 33], p. 8.

Volume 7, numbers 1-12, January-December 1954.

No. 1, January, 16 pp., 11 illus., 2 charts, 3 maps, contains: Petroleum in California, including 5 illus., 1 chart, pp. 1-3, 4; Publications of the State Division of Mines on petroleum, pp. 3-4; World's deepest exploratory well in California, p. 4; World's deepest producing well in California, p. 4; New discovery in Wheeler Ridge, p. 4; Los Angeles basin, p. 4; Titanium mining, p. 4; Mining news notes, p. 4; Map, principal marine sedimentary basins, p. 5; Map, outline of portion of California showing district boundaries, oil and gas fields, p. 6; Index to oil and gas field maps, and Index to fields for which Division of oil and gas maps are not available, p. 7; Map index to new topographic quadrangles of California, pp. 8-9; Chart, California topographic maps, 1953, pp. 10-12; Consolidated index to *Mineral Information Service*, vols. 1-6, pp. 13-14; new issue of *Journal* [October 1953], p. 14; Chronicle of quicksilver [*De argento vivo*], including 6 illus., p. 15. **No. 2, February, 8 pp., 8 illus., contains:** Salt, including 8 illus., pp. 1-6; New base map of California, p. 6; New geologic map [Pearland quadrangle], p. 6; New bulletin published [Bulletin 168], p. 7; Area in northern California mapped [Bulletin 164], p. 7; Gold, silver, copper, lead and zinc in 1953, p. 7; Mineral marketing information, p. 7. **No. 3, March, 8 pp., 2 charts, 13 illus., contains:** Fluorescence of minerals, including 1 chart, pp. 1-3 (reprinted separately, 1960); Division of Mines fluorescent exhibit, p. 2; Chart, California topographic maps, p. 4; Mineral marketing information, p. 4; Manganese mining in southern California, p. 5; Stone quarries, including 13 illus., pp. 6-7; New report on tungsten [Special Report 35], p. 8. **No. 4, April, 12 pp., 4 charts, 11 illus., 1 map, contains:** Mica, including 1 chart, pp. 1-5; 300,000 maps distributed, p. 5; Chart, Production and utilization of California petroleum in 1953, p. 6; Mineral marketing information, p. 6; Walibu quicksilver mine exploration, p. 6; Conference on clay, p. 6; Early oil mining in California, including 1 chart, 1 map, p. 7; Division of Mines library moved, including 2 illus., p. 8; Chart, California topographic maps, p. 9; Mineral exhibit reopened, including 1 illus., p. 9; New report on Amador County [January 1954 *Journal*], including 6 illus., pp. 10-11; New gypsum report [Special Report 36 Bulletin 163, 155], including 1 illus., p. 11. **No. 5, May, 8 pp., 6 illus., 3 charts, 1 map, contains:** Landslides in Ventura Avenue oil field, including 2 illus., p. 1; Defense minerals program, including 1 chart, 1 map, pp. 2-3, 7; Selected references to lightweight aggregate materials made from clay, shale and slate, including 4 illus., pp. 4-5, 7; Chart, Crude oil reserves in the United States, p. 6; Chart, California topographic maps, p. 6; Two new quadrangle reports [Bulletin 166, 167], p. 7; Mineral springs and Santa Clara County featured [April 1954 *Journal*], pp. 78. **No. 6, June, 12 pp., 5 charts, 1 map, 5 illus., contains:** Glass sand in California, including 1 map, 2 charts, pp. 1-4; Flotation of Del Monte sand, by Wm. E. Messner, including 1 chart, 4 illus., pp. 4-8; Illus., Crystal Silica Company operation, pp. 6-7; Conference on clays and clay technology, p. 8; Chart, California counties in order of total value of recorded mineral production to and including 1951, p. 9; Chart, California topographic maps, p. 10; Mineral marketing information, pp. 10-11; Mineral news notes, p. 11; Five new maps on open file, p. 11. **No. 7, July, 8 pp., 1 illus., 2 charts; 1st printing; 2d printing (revised); contains:** Uranium, 1 illus., pp. 1-5; U.S. Bureau of Mines offices move, p. 4; Land Management offices changed, p. 4; Petroleum notes, pp. 4-5; Uranium booklet, p. 5; Mineral marketing information, p. 5; Chart, Table of common uranium minerals, pp. 6-7; Chart, California topographic maps, pp. 6-7. **No. 8, August, 12 pp., 4 charts, contains:** California mineral production in 1952, including 3 charts, pp. 1-7; Mineral production in 1952 compared with 1951, p. 2; Mineral production in counties of California in 1952, p. 2; Price list of available publications, pp. 8-11; Chart, Estimated mineral production in California in 1953, p. 11; Mineral marketing information, p. 11; Division of Mines exhibit, p. 11; New barite report [Special Report 39], p. 12. **No. 9, September, 8 pp., 4 charts, contains:** Zirconium, including 2 charts, pp. 1-3; Chart, List of commercial assay and testing laboratories, pp. 4-5; Quicksilver, p. 6; Chart, Topographic maps, p. 7; Oil combustion drive project, p. 7; Man-made island oil drilling project, p.

7; Critical minerals report, p. 7; *Journals* reprinted [July 1953, October 1953, January 1954], p. 7. **No. 10, October, 20 pp., 11 photos, 1 map, contains:** Pozzolans in California, by Frederick W. Drury, Jr., pp. 1-6, 5 photos; American Association of Petroleum Geologists, p. 6; California topographic maps, p. 7; Quicksilver purchase program [GSA], p. 7; Geological Society of America annual meetings, p. 7; Specifications and standards of mineral products, p. 8; Abbott quicksilver mine, p. 8; Quicksilver mining in New Idria district, p. 9, 1 photo; Mt. Jackson mine, p. 9; Mineral production, p. 9; Expanded shale, p 9; Map of California showing occurrences of radioactive minerals, pp. 10-11; The American Ceramic Society meeting, p. 12, 3 photos; Mineral marketing information, p. 13; Chili Bar slate mine, p. 13, 1 photo; New mining law, pp. 14-16; New mining law reviewed, pp. 16-17; Location of uranium claims, p. 17; AEC to terminate uranium circular no. 7, p. 17; AEC Raw Materials Office transferred, p. 17; AEC selects west coast information depository, p. 17; First California uranium ore shipped, p. 18; Uranium report reissued [Special Report 37], p. 18; Popular counter handbook revised, p. 18, 1 photo; Interpreting geologic maps, p. 18; New literature survey, p. 19; Uranium bibliography, p. 19; Essays of William Morris Davis, p. 19; Wollastonite, p. 19. **No. 11, November, 8 pp., 7 illus., contains:** Nickel in California, pp. 1-5, 5 illus.; New uranium occurrences in California, p. 5; Mort Turner appointed chief geologist of Puerto Rico, p. 5; Schedule of prices for uranium ore, p. 6; Classification of uranium deposits by host rock (table 1), p. 7; Tentative classification of uranium deposits by origin (table 2), p. 7. **No. 12, December, 8 pp., contains:** Cadmium, pp. 1-2; Additional uranium finds, p. 2; Index to volume 7, pp. 3, 5-6; New California topographic maps, pp. 4-5; Mineral marketing information, p. 4; New report on talc [Special Report 38], p. 7; First California uranium ore shipment [correction], p. 7; Uranium prospector's guide out of print, p. 7; *Minerals of California* [Bulletin 136-history], p. 7.

Volume 8, numbers 1-12, January-December 1955.

No. 1, January, 16 pp., 6 illus., contains: California mineral production in 1954, pp. 1-4, 10-13, 4 illus.; California topographic maps, 1954, pp. 5-9, 1 map; Legal guide reprinted, p. 3; Notice to all subscribers, p. 13; New map of San Francisco, p. 13; California mineral production in 1953, p. 14; Mineral production in 1953 compared with 1952, p. 14; Mineral production in counties of California, 1953, p. 14; Colorado Plateau Uranium Ore Project (Photostatic copy of statement showing tonnage, settlement assay . . . on first carload shipment of commercial uranium ore from California), p. 15; New report on desert area [Bulletin 165], p. 16. **No. 2, February, 12 pp., 13 illus., contains:** Cement, pp. 1-9, 6 illus; Notice to subscribers, p. 1; French bibliographic digest, p. 9; Biography of an oil man (Hugh Roy Cullen), p. 9; ASTM standards for coal and coke, p. 9; Correction, p. 9; Mineral exhibit features cement plant model, p. 10, 3 photos; Types of Geiger counters, p. 11, 4 photos; Two wells completed on offshore island, p. 12; Alleghany-Downieville lode gold mines, p. 12. **No. 3, March, 8 pp., 2 illus., contains:** Bentonite in California, pp. 1-5, 2 illus.; California topographic maps, p. 6; Legal guide out of print, p. 6; Barstow bulletin [165] nearly out of print, p. 6; Two new books on prospecting, p. 7; Manganese purchase program, p. 7; New AEC office in Bakersfield, p. 7; Copper and uranium, p. 7; Scintillation counter designed, p. 7; Los Angeles County studied [July-October 1954 *Journal*], p. 8. **No. 4, April 8, pp., 2 illus., contains:** Mineral resources of the San Francisco area, pp. 1, 6, 1 photo; Wollastonite, pp. 1-3, 1 photo; Airborne anomaly maps, p. 4; New book for uranium prospectors, p. 4; Airborne exploration for uranium, pp. 4-5; Mineral marketing information, p. 5; National minerals policy, p. 5; Bay area guidebooks [Bulletin 154], p. 5; World's deepest test well abandoned, p. 7, 1 chart; Ubehebe area studied [Special Report 42], p. 7; New issue [January 1955] of *Journal*, p. 7. **No. 5, May, 8 pp., 2 illus., contains:** Uranium, pp. 1-7, map; New book for uranium prospectors, p. 7; Assessment work deadline, p. 8; New clay bulletin [Bulletin 169], p. 8; Division offices not damaged in fire, p. 8,

1 illus. **No. 6, June, 8 pp., 1 photo, 3 charts, contains:** Clay, pp. 1-7, 1 photo, 3 charts; Western Governors Mineral Policies Conference, p. 1; New books for geologists, p. 3; Foraminifera of the Lodo formation described, p. 3; Production and utilization of California petroleum in 1954, p. 5; Newly published U.S.G.S. topographic maps of California, p. 6; New book on clay [Bulletin 169], p. 7; Perlite, Sacramento County, featured [April 1955 *Journal*], p. 8. **No. 7, July 8 pp., 4 illus., contains:** Land subsidence in California, pp. 1-5, 4 illus.; Earthquake damage at Wilmington, p. 6; Mineral exhibit hours, p. 6; Cinnabar in San Mateo County, p. 7; New [California] topographic maps, p. 7; Lead production increased, p. 7; New geology text, p. 7. **No. 8, August, 8 pp., 2 illus., contains:** Saline Valley area, Inyo County, pp. 1-5, 2 illus.; Mining claims in national parks and monuments, p. 5; New topographic maps, p. 5; New issue of French bibliographical digest, p. 5; F.C. Van Deinse [necrology], p. 6; *Journal* reprinted [July-October 1954], p. 6; New geologic report [Special Report 40], p. 6; New *Journal* [July 1955], pp. 6, 7; Mineral marketing information, p. 7; George W. Hallock [necrology], p. 7. **No. 9, September, 8 pp., 7 illus., contains:** Geology of southern California—Bulletin 170, pp. 1-5, 7, 8, 7 illus.; Newly published U.S.G.S. topographic maps of California, p. 6; New cement plant for southern California, p. 6; New bulletin will be aid to prospectors [Bulletin 170], p. 6; Mineral marketing information, p. 7; New book on Mother Lode [Special Report 41], p. 7. **No. 10, October, 8 pp., 1 map, contains:** Chromite in California, pp. 1-2, 4-5, 1 map; New mining law, pp. 3-4; Mining branch holds fall meeting, p. 6; California gold and silver production increased, p. 6; Mercury, 1955, p. 6; Mineral marketing information, pp. 6-7; New geologic maps of area in Los Angeles County [Bulletin 172], p. 7. **No. 11, November, 8 pp., 10 photos, contains:** Molybdenum, pp. 1-4; Newly published U.S.G.S. topographic maps of California, p. 5; New glass sand operations, p. 5; New glossary for engineers, p. 5; From clay to tile, pp. 6-7, 10 photos; New geologic map sheets, p. 8. **No. 12, December, 8 pp., 4 illus., contains:** Sand and gravel, pp. 1-7, 4 illus.; New mining law, pp. 7-8.

Volume 9, numbers 1-12, January-December 1956.

No. 1, January, 8 pp., 4 illus., contains: Mother Lode book reprinted [Bulletin 141], pp. 1, 2; Current mining activities along Highway 49, pp. 1, 3-5, 1 photo; New book on Temecula area [Special Report 43], p. 2; L.A. Norman leaves Division, p. 2; New map exhibit, p. 2, 1 photo; New topographic maps, p. 5; Index to volume 8, pp. 6-7, 1 chart; Price change [Special Report 23], p. 7; Gift by W.S.T. Smith, p. 8; Staff changes, p. 8; Bibliography on sea [Special Report 44], p. 8; Leaf gold in Division's mineral exhibit [photo], p. 8. **No. 2, February, pp. 1-16, 3 illus., contains:** Highlights in California mineral production, 1955, pp. 1, 15-16; Mineral production by counties, 1954, pp. 2-7; [California Historical Society change of address], p. 5; New soils map, p. 6; County mineral production, 1954, p. 7; New *Journal* [October 1955], p. 7; Index map to new topographic quadrangles of California made available in 1955 by U.S. Geological Survey, pp. 8-9; California topographic maps, 1955, pp. 10-12; New Death Valley book, p. 12; California topographic maps, 1955—advance prints, p. 13; Stratigraphic geology, p. 13; California mineral production in 1954, p. 14; Twenty years in California mineral production, 1935-1955 [chart], p. 14; California mineral production in 1955 compared with 1956, p. 15; Student exhibit [Laboratory Services], p. 16, 1 photo. **No. 3, March, 12 pp., 5 illus., contains:** Titanium, pp. 1-6, 5 illus.; Recommendations for a national minerals policy, pp. 7-10; W. E. Wrather, Director of U.S.G.S. retires, p. 10; New book on uranium and thorium deposits in California [Special Report 49], p. 10; Mineral marketing information, p. 11; California topographic maps, advance prints, pp. 11, 12; New books for collectors and students, p. 11. **No. 4, April, 8 pp., 3 illus., contains:** Earthquakes and faults in California, pp. 1-5, 3 illus.; New earthquake book [Bulletin 171], pp. 5-6; AIME to meet in Seattle, pp. 6, 7;

Tungsten program closing, p. 7; C. J. Kundert leaves Division, p. 7; Sand and gravel featured in new issue of *Journal* [January 1956], p. 7; California petroleum, 1955, p. 8. **No. 5, May, 12 pp., 9 illus., contains:** Tungsten, pp. 1-7, 4 illus.; Topographic maps, p. 7; New land open to prospecting, p. 8; New sand and gravel plant to use heavy media, p. 9; *Geology of southern California* [Bulletin 170] out of print, p. 9; Devils Postpile, Sierra crest east of Mammoth Lakes, Silver Lake [photos], p. 9; California topographic mapping coverage since World War II, June 30, 1955 [map], pp. 10-11. **No. 6, June, 8 pp., 1 illus., contains:** Gypsum, pp. 1-5, 1 map; Dimension stone, p. 6; Topographic maps, p. 6; Mineral marketing, p. 7; Shasta area active, p. 7; Limestone mine working, p. 8; Gold mine working, p. 8. **No. 7, July, 8 pp., 6 illus., contains:** Lead and zinc in California, pp. 1-6, 6 illus.; New list of exploratory holes and revised oil and gas map published [Special Report 45], p. 6; Mineral news notes, p. 6; "Basic studies in the clay industry"—new symposium on clay fabrication published [April 1956 *Journal*], p. 7; Mineral marketing, p. 7; Mineral news notes, p. 7. **No. 8, August, 8 pp., 5 illus., contains:** The mineral resources of the Ione formation, pp. 1-5, 3 illus.; U.S. Geological Survey office moves, p. 6; "Rock club manual" released, p. 6; "Evolution of igneous rocks" reprinted, p. 6; New book on microfossils, p. 6; Rock products in Contra Costa, p. 6; Geologic map of California, p. 7; Mineral marketing information, p. 7; Wax-extraction plant, open-pit coal mine, of American Lignite Products Company [photos], p. 7. **No. 9, September, 8 pp., contains:** Lithium compounds, pp. 1-5; Fire flooding, pp. 5-6; Time limit on chrome purchasing program extended, p. 6; New purchase program for tungsten, pp. 6-7; Surface rights to unpatented mining claims, p. 7; Operating data on mercury mines, p. 7. **No. 10, October, 12 pp., 6 illus., contains:** American Mining Congress to meet, pp. 1, 3; Gold, pp. 1-2, 3-10, 4 illus.; AIME meeting, p. 3; General Warren T. Hannum [necrology], p. 10; New Director for U.S.B.M., p. 10; A.A.P.G. meeting, p. 10; New tungsten price schedule, p. 10; New highways to use California mineral products, p. 11, 2 photos; New addresses [U.S. Geological Survey, California Historical Society], p. 11; New report on Sierra [Special Report 46], p. 12; Southwest mineral conference, p. 12. **No. 11, November, 8 pp., contains:** Talc, p. 1-6; Public law 167 and surface rights on unpatented mining claims, p. 6; Mineral market quotations, p. 7; Chemical and mining inter-industry conference, p. 7; Cement output increased, p. 7. **No. 12, December, 8 pp., 7 illus., contains:** Peat, pp. 1-5, 4 illus.; New book on atomic minerals, p. 5; Index to volume 9, pp. 6-7; Concrete tetrapods, pp. 7-8, 3 photos.

Volume 10, numbers 1-12, January-December, 1957.

No. 1, January, 8 pp., 5 illus., contains: Pumice, pumicite, and volcanic cinders in California, pp. 1-5, 5 illus.; [Tetrapods, additional data], p. 5; California topographic maps, advance prints, p. 6; California topographic maps, final maps, p. 7; New issue of *Journal* now available [October 1956], p. 7; New pumice book [Bulletin 174], p. 8. **No. 2, February, 12 pp., 5 illus., contains:** California mineral production, 1956, pp. 1-2; California topographic maps, advance prints, p. 2; Abbott quicksilver mine, Mountain Copper Company pyrite mine [photos], p. 2; California mineral production by commodity groups, 1955 [chart], p. 3; Mineral production by counties, 1955, pp. 4-9; Counties of California mineral production in 1955, p. 9; Events in California mineral production, pp. 10-11, 2 illus.; Folio of Jurassic system, p. 11; New map of desert, p. 11; New edition of "Minerals of California" [Bulletin 173], p. 12. **No. 3, March, 8 pp., 9 illus., contains:** Minerals of California, pp. 1-5, 6 photos; Aggregate for new highways, p. 5, 1 photo; New quicksilver plant in San Mateo County, p. 6, 1 photo; International Mineral Dressing Congress, Stockholm, September 18-21, 1957, pp. 6, 7, 1 illus.; California petroleum, 1956, p. 7; New revised edition of "Minerals of California" [Bulletin 173], p. 8. **No. 4, April, 8 pp., 5 illus., contains:** Commercial silica, pp. 1-7, 3 illus.; Guadalupe [quicksilver] mine increases production, pp. 7-8, 2 photos. **No. 5, May, 8 pp., 10 illus., contains:** San Francisco earthquake of March 22, 1957, pp. 1-5, 7 illus.; Scheelite

crystal discovery, pp. 6-7, 3 illus.; Sixth clay conference, p. 7; Mineral law, p. 7. **No. 6, June, 12 pp., 5 illus., contains:** Rare earth elements, by Lloyd C. Pray, pp. 1-8, 4 illus.; Company will test rare-earth ores for prospectors, p. 9; U.S. Geological Survey releases logs of cores in desert, p. 9; Change of price of topographic maps, p. 9; New issue of *Minerals Yearbook* by U.S. Bureau of Mines, p. 9; New offshore platform drilling near Summerland, p. 10, 1 photo; *Journal* to be late, p. 11 [January-April 1957], p. 11. U.S.G.S. exploring desert borates, p. 11; Sixth Commonwealth mining tours, p. 11; Proceedings of World Conference on Earthquake Engineering now on sale, p. 11. **No. 7, July, 8 pp., 5 illus., contains:** Aluminum, pp. 1-6, 2 photos; New reports on Bishop district [Special Reports 47, 48], p. 6; Mercury purchase program extended, p. 6; Dimension stone production increasing, p. 7, 3 photos. **No. 8, August, 20 pp., 14 illus., contains:** Elementary placer mining methods [gold], pp. 1-7, 7 illus.; Bradley, Browning reappointed to S.M.B., p. 7; Tidelands oil bill signed, p. 8; New issue of *Journal* [January-April 1957], p. 8; Mercury production in 1956, p. 8; Goodwin leaves staff, p. 8; New geologic map of Oakland, p. 9; Geophysical map of Los Angeles Basin, p. 9; Report on Santa Ana Mountains, p. 9; Maps of cities available, p. 9; Recommendations for a national minerals policy, pp. 10-12; Sixth clay conference, pp. 12-13; References on selenium, p. 13; West Shasta copper-zinc district, by A. R. Kinkel Jr., W. E. Hall, and J. P. Albers, pp. 14-17, 2 illus.; Mojave Desert saline deposits, p. 18; San Francisco water, pp. 18, 20; Mariposa County scenes [photos], p. 19. **No. 9, September, 8 pp., 9 illus., contains:** Bishop district, California, pp. 1-4, 9 illus.; Proposed wildlife land withdrawals, p. 5; Rare mineral found in California (hambergite), p. 5; "Minerals of California" supply low [Bulletin 173], p. 5; New California topographic maps, Jan.-June 1957, pp. 6-7. **No. 10, October, 12 pp., 6 maps, contains:** Boron, pp. 1, 2-5; Proposed wildlife withdrawal, pp. 1, 6-12, 6 maps. **No. 11, November, 8 pp., 2 illus.; Supplement, 11 pp., cover illus.; contains:** Mercury, pp. 1-7, 2 illus.; Oil progress week, p. 6; BSA geology merit badge, p. 7; Calendar, p. 8; Supplement (issued separately); Available publications, California Division of Mines, November 1957, 11 pp., cover photo. **No. 12, December, 8 pp., contains:** Changing gold into mercury, p. 1; Index to Mineral Information Service, volumes 1 to 10, 1948 to 1957, pp. 2-7; DMEA contracts in California, p. 7; New List of Available Publications of Division of Mines now ready for distribution, p. 8; Tax decision, p. 8; New land open to location, p. 8.

Volume 11, numbers 1-12, January-December, 1958.

No. 1, January, 12 pp., 5 illus., contains: Mineral production review, California, 1957, pp. 1, 9-10, 3 photos; Mineral production by counties, 1956, pp. 2-6; California mineral production by commodity groups (chart), p. 7; California mineral production in 1956, p. 8; Mineral production by counties, 1956, p. 8; Permanente Cement Company plant [photo], p. 8; Mineral market quotations, p. 11; California Landscape reprinted [Bulletin 158], p. 11. **No. 2, February, 8 pp., 8 illus., contains:** Olaf P. Jenkins, Chief, Division of Mines, retires, pp. 1, 2, 1 photo; Plan and progress of state geologic map, pp. 1, 3-4, 2 maps; New book on gem materials, p. 2; New edition of "Mineral Commodities of California" now available (Bulletin 176), pp. 4-8, 5 illus. **No. 3, March, 8 pp., 2 illus., contains:** Petroleum in California, pp. 1-8, 2 illus.; American Association of Petroleum Geologists to meet in March, p. 8; New phone number for S.F. office of Division of Mines, p. 8. **No. 4, April, 8 pp., 2 illus., contains:** Potash, pp. 1-6, 1 map; New supply of Bulletin 173, p. 7; Oakeshott to head Division, p. 7; Recording fee changed, p. 7; Field trip logs [Sixth National Clay Conference], p. 7; O. P. Jenkins honored, p. 7, 1 photo; New exhibit of fossils, p. 8. **No. 5, May, 8 pp., 2 illus., contains:** Sulfur and pyrites, pp. 1-7, 2 illus.; Cement in 1957, p. 7; New German book, p. 7; Mineral commodities of California [Bulletin 176], p. 7; New issue of *Journal* [January 1958], p. 8. **No. 6, June, 8 pp., 4 illus., contains:** Gem stones, pp. 1-7, 1 map; Eocene conglomerate yields sand and gravel, pp. 7-8, 3 photos. **No. 7, July, 8 pp., 3 illus.,**

contains: Salt, pp. 1-6, 2 illus.; More aggregate to be used, p. 6; Kennedy mine tailing wheels, p. 7, 1 photo; Logs of desert cores on file, p. 7; New edition of suggestions to Survey authors published, p. 7; New book on salt [Bulletin 175], p. 8. **No. 8, August, 12 pp., 8 illus., contains:** Spectrograph[h]ic analysis of minerals and rocks, pp. 1-7, 6 illus.; New index to geologic mapping [Special Report 52], p. 7, 1 map; Book on mining law [Survey of Mining Legislation with Special Reference to Asia and the Far East], p. 7; Commercial assaying and testing laboratories in California, pp. 8-9; American continental shelves, p. 10; Islais Creek basin mapped, p. 10; Himalaya [gem], mine reopened, p. 11, 1 photo; Coming events, p. 11; Sacramento Valley groundwater studied, p. 11; Aggregates, clay studied [April 1958 *Journal*], p. 8. **No. 9, September, 8 pp., 5 photos, contains:** Tulare County studied, pp. 1-2, 8, 5 photos; American Mining Congress to meet, pp. 1, 3-6; New Mint charges, pp. 6-7; Staff changes, p. 7; Coming events, p. 8; **No. 10, October, 12 pp., 13 illus., contains:** Death Valley, p. 1-9, 9 illus.; Bound volumes of the *Journal* now available, p. 9; Mining legislation, p. 10; Proposal may withdraw land for Bristlecone Pine forest, pp. 10-12, 4 illus.; Geologic map of Death Valley due, p. 12; Age of granite measured [Special Report 54], p. 12; Coming events, p. 12; How to order publications, p. 12. **No. 11, November, 12 pp., 9 illus.; Supplement, 27 pp.; contains:** California mineral production, 1957, pp. 1-10, 5 illus.; Mineral markets, p. 7; Mining on power site lands, p. 10; Sandblasting Bay Bridge, pp. 11-12, 4 illus.; Petroleum, 1957, p. 12; *Supplement* (issued separately): Available publications, California Division of Mines, November 1958, compiled by Mary H. Rice and Elisabeth L. Egenhoff, 27 pp., cover photo. **No. 12, December, 8 pp., 9 illus., contains:** Prospecting, exploring, and developing the small mine, pp. 1-6, 8 photos; New book on geologic names of North America, p. 6; Uranium handbook revised, p. 6; Reprints of county reports, pp. 6-7; July 1958 *Journal* now available, p. 7, 1 photo; How to order Division of Mines publications, p. 12.

Volume 12, numbers 1-12, January-December, 1959.

No. 1, January, 12 pp., 6 illus., contains: California mining review, 1958, pp. 1-7, 5 illus.; Uranium purchasing changed, pp. 7, 10; Index to Volume 11, pp. 8-9; Fletcher M. Hamilton [necrology], p. 9; Staff changes, p. 10; New publications list, p. 10; New San Francisco map, p. 10; Groundwater study, p. 11; How to order, p. 11; *Journal* discontinued, p. 11; DeWitt Nelson reappointed, p. 11; Sacramento office moves, p. 11; Ian Campbell appointed Chief of Division, p. 12, 1 photo. **No. 2 February, 16 pp., 9 illus., contains:** Limestone, dolomite, and lime products, pp. 1-11, 14-15, 5 illus.; Lime kilns, pp. 12-13, 4 photos; Last *Journal* [October 1958], p. 15; Bulletin 154, p. 15; New Death Valley sheet, p. 16; AIME to meet, p. 16; New OME, p. 16; How to order, p. 16. **No. 3, March, 8 pp., 3 photos, contains:** Niobium (columbium) and tantalum, pp. 1, 2-3, 1 photo; Recent Mine publications [Death Valley geologic sheet, Bulletin 154, Special Reports 50, 51, October 1958 *Journal*], pp. 1, 6-7, 8, 2 illus.; Sources of legal information for miners and prospectors, pp. 4-5; Coming events, p. 7. **No. 4, April, 8 pp., 6 photos, contains:** Quartz family minerals, pp. 1-5, 5 photos; Minerals of California [Bulletin 173], p. 6; Guadalupe [quicksilver] mine explored, p. 6; Mineral markets, p. 6; Tick menace, p. 7; Bert C. Austin appointed to Mining Board, p. 7; New book on landslides [Landslides and Engineering Practice], pp. 7-8, 1 photo; Story of a mine, p. 8; Alturas geologic sheet to come, p. 8; Coming events, p. 8. **No. 5, May, 12 pp., 6 illus., contains:** Offshore geology and oil resources, pp. 1-7, 3 illus.; Water rights and gold mining, pp. 8-10, 3 illus.; Mining Board organization, p. 10; Mineral markets, p. 10; Alturas map to come, p. 11; W. F. Dietrich [Bulletin 99], p. 11; New clay study, p. 11; Office of Mineral Resources, p. 11; Coming events, p. 12; New rock book, p. 12; Mercury looks up, p. 12. **No. 6, June, 8 pp., 9 illus., contains:** Geology of northeastern California, pp. 1-7, 8 illus.; Mineral markets, pp. 7-8; Hubert 0. Jenkins [necrology], p. 8; Land

reopened, p. 8. **No. 7, July, 8 pp., 9 illus., contains:** Adobe brick, pp. 1-6, 8 illus.; Pajaroello, p. 7; Mining men appointed [Western Governors Mining Advisory Council], p. 7; Conferences highlight urban expansion, p. 8, 1 photo. **No. 8, August, 12 pp., 6 illus., contains:** Geology along U.S. Highway 40, by Philip A. Lydon, pp. 1-9, 2 photos, 2 maps; Manganese program ending, p. 9; Land withdrawal [Twenty-nine Palms], pp. 10-11, 1 map; Mining Board commends Fish and Game policy, p. 11; Unusual asbestos ore in Fresno County, pp. 11-12, 1 photo; New book [Principles of Geology], p. 12; Authorship, p. 12. **No. 9, September, 12 pp., 9 illus., contains:** Mineral exhibit, by George L. Gary and Robert A. Matthews, pp. 1-11, 9 illus.; [Thomas H.] Rodgers appointed to Mining Board, p. 11; Fire danger, p. 12; Los Angeles office quarters soon to be moved, p. 12; Engineering geologists [to meet], p. 12. **No. 10, October, 8 pp., 5 illus., contains:** Soda ash industry of Owens Lake, 1887-1959, by William E. Ver Planck, pp. 1-6, 4 illus.; E. Collins honored, p. 6; New program for Division, p. 7; West Yellowstone earthquake, p. 7, 1 map; New map ready [San Luis Obispo sheet, geologic map], p. 8. **No. 11, November, 12 pp., 8 illus., contains:** California mineral production in 1958, by Henry H. Symons and Fenelon F. Davis, pp. 1-9, 4 illus.; Old arrastres near Sierra Buttes, by Philip A. Lydon, pp. 1, 10-11, 4 illus.; [Charles A.] Anderson appointed Chief Geologist of U.S. Geological Survey, p. 9; J. C. O'Brien retires, p. 9; Mining in California stream beds, p. 11; Duluth conference, p. 11; Two new economic reports [Special Reports 55, 56], p. 12. **No. 12, December, 12 pp., 9 illus., contains:** Urbanization and the mineral industry, by Harold B. Goldman, pp. 1-5, 9 illus.; Single-purpose withdrawals as a danger to national resource security, by Earl F. Cook, pp. 6-7; Death Valley withdrawals, p. 7; Manganese discovery, p. 7; OME moves, p. 7; USGS enlarges Menlo office, p. 7; Progress report to the State Mining Board, by Ian Campbell, pp. 8-9; Landslide map reviewed, p. 9; New report on clay, p. 9; Index to Volume 12, pp. 10-11; New Mines reports [Bulletin 177, Special Report 53], p. 11; Land reopened, p. 11; Coming events, p. 12.

Volume 13, numbers 1-12, January-December, 1960.

No. 1, January, 16 pp., 12 illus., contains: Geologic sketch of the southern Coast Ranges, by Gordon B. Oakeshott, pp. 1-13, 8 illus.; Mineral marketing, p. 13; New Mines program, p. 14; A page from history [concretions from Piru], p. 14, 2 photos; AIME to hold 1960 Metals & Minerals meeting, p. 14; [Chico sheet, state geologic map] p. 15, 2 photos; New books [*The earth shook, The sky burned; Rocks to riches; General crystallography*], p. 15; San Fernando bulletin released [Bulletin 172], pp. 15-16; Santa Cruz map ready [state geologic map], p. 16. **No. 2, February, 16 pp., 7 illus., contains:** Maps used in mineral investigations, by Bennie W. Troxel, pp. 1-13, 6 figs.; California mining events, 1959, by Fenelon F. Davis and Staff, pp. 1, 14-16, 1 photo; Alleghany-Downieville maps, p. 16; **No. 3, March, 12 pp., 14 illus.; Supplement, contains:** Geothermal power, by James R. McNitt, pp. 1-9, 6 figs., 4 photos; Division of Mines conducting shale survey, p. 9; Henry Symons retires, p. 10, 2 photos; Special Report [59] on beach sands, p. 10; Hydraulic mining history published, p. 11, 2 photos; Withdrawn lands reopened, p. 11; Report on 1957 S.F. earthquake now available [Special Report 57], p. 11; New references on California geology, p. 12. *Supplement* (issued separately); Available publications, California Division of Mines, March 1960, compiled by Mary H. Rice and Elisabeth L. Egenhoff, 29 pp., cover photo. **No. 4, April, 8 pp., 11 illus., contains:** Mining claims under Public law 167, by Henry H. Symons, pp. 1-4, 8 maps; New report on limestone and dolomite [Special Report 58], p. 4; Commercial guano, by Edmund W. Kiessling, p. 5; Coming events, p. 5; Lake Elsinore quadrangle studied [Bulletin 146], p. 6; Petroleum production in 1958 and 1959, p. 6; Santa Maria map sheet available, p. 7, 1 map; Report on volcanic domes near Jackson [Special Report 60], p. 7, 1 photo; [Automatic purchase plan, geologic map of California], p. 8. **No. 5, May, 12 pp., 12 illus., contains:** Ex-

pansible shale, by John L. Burnett, pp. 1-6, 9 illus.; [Bulletin 176], p. 6; Age determination by the lead-alpha method, pp. 7-11, 1 map; New references on California geology, p. 11; Nevada City buildings to go [Bulletin 141], p. 11, 2 photos; Coming events, p. 12; Legal guide, out of print, p. 12. **No. 6, June, 8 pp., 8 illus., contains:** Skin diving for gold in California, by Wiliam B. Clark, pp. 1-8, 8 illus. **No. 7, July, 8 pp., 5 figs., contains:** Fossils: what they mean and how to collect them, by L. R. and R. B. Saul, pp. 1-7, 5 figs.; Recovery of alumina from anorthosite, pp. 7-8; New mining law [millsites], p. 8; Locating guano deposits—a correction, p. 8; New U.S.G.S. publication, p. 8. **No. 8, August, 12 pp., 12 illus., contains:** The geologic map, by Quintin A. Aune, pp. 1-8, 8 figs.; Interpretation of contour lines, pp. 8-9, 1 fig.; Sacramento office moves, p. 8; Surface rights determination, p. 9, 3 maps; Withdrawals and reservations of public lands and resources, pp. 9-10; Public land survey corners, p. 10; Mineral marketing, p. 10; State Mineralogist's annual report now available [Report 56], p. 10; Solving the materials problem by substitution, by John J. Schanz Jr., pp. 11-12. **No. 9, September, 8 pp., 3 figs., 2 tables, contains:** Grain size of fragmental sedimentary rocks, by James R. Evans, pp. 1-8, 3 figs., 2 tables. **No. 10, October, 8 pp., illus., contains:** California mineral production in 1959, by Fenelon F. Davis, pp. 1-6, 7, 1 illus., tables; New exploration expenditure law, p. 6; Surface rights determination, p. 7, 2 illus.; New report on Poe Tunnel [Special Report 61], p. 8; Engineering geology meeting [California Association of Engineering Geologists], p. 8; Bert Austin—in memoriam, p. 8; Temporary deferments in assessment work, p. 8. **No. 11, November, 8 pp., 8 illus., contains:** Sampling mineral deposits, pp. 1-7, 7 figs.; Minerals eligible for federal assistance [OME], p. 7; New geologic report available [Special Report 63], p. 7; Northern California asbestos deposits described [A reconnaissance survey of asbestos deposits in the serpentine belt of northern California], p. 7; Orchard Peak area report released [Special Report 62], p. 8, 1 photo; Bulletin 158 in third printing, p. 8; Bulletin 170 re-issued, p. 8. **No. 12, December, 8 pp., 4 photos, contains:** Exploration costs of small mines, by H. E. Krumlauf, pp. 1-4; Mother Lode book reprinted [Bulletin 141], p. 4, 2 photos; Bulletin 158 reprinted, pp. 4-5, 1 photo; New clay report [Special Report 64], p. 5; New book on boron minerals, p. 5, 1 photo; Roadside zone withdrawals; Our sincere apologies [Bulletin 170 reprint]; New publications, 1960, p. 6; Ukiah map sheet available, pp. 6-7; Uncolored Ukiah map, p. 7; New report on chromite treatment [Utilization studies on chromite from Seiad Creek, California], p. 7; List of basement wells in California and Nevada, p. 7; Water-resources reports, p. 8.

Volume 14, numbers 1-8, January-August, 1961.

No. 1, January, 12 pp., map, 5 photos, contains: Geologic sketch of the northern Coast Ranges, by Salem J. Rice, pp. 1-9, map, 3 photos; Bay area geologic road guides available, p. 9, 1 photo; Recent reports by U.S.G.S., p. 9; Index to volume 13, pp. 10-11; Bulletin 170 reprinted, pp. 10-11, 1 photo; Los Angeles office to move, p. 12. **No. 2, February, 20 pp., 5 illus., contains:** Mineral rights, by F. Harold Weber Jr., pp. 1-15, 3 figs.; Geology of northwestern California [Bulletin 179], p. 15, map; Surface rights determination, pp. 16-17, illus.; California mineral production, 1960, p. 18; Land withdrawal, p. 19; New book on offshore southern California [The sea off southern California], p. 19; California mine is named "open pit mine of 1960", p. 19; New book on paleogeology [Paleogeologic maps], p. 19. **No. 3, March, 8 pp., 6 photos, contains:** The California minerals industry in 1960, by Fenelon F. Davis and staff, pp. 1-6, 6 photos; New California relief map [Bull. 158], p. 7; Lands open to mineral entry, p. 7; Metals and minerals conference [AIME], p. 7; U.S. Geological Survey summarizes results of recent work, pp. 7-8; GSA Cordilleran section to meet, p. 8. **No. 4, April, 12 pp., 10 illus., contains:** Pleistocene lakes of southeastern California—1, by Robert P. Blanc and George B. Cleveland, pp. 1-8, 1 map, 2 photos; A brief look at the mining, metal, and petroleum indus-

try, by Ronald R. McNaughton, pp. 8-9; New report on iron and steel scrap [Iron and steel scrap in California and Nevada], p. 9; Landslide classification chart available, pp. 9, 12; Surface rights determination, pp. 10-11, 7 maps; Coverless Mother Lode bulletin [Bulletin 141], p. 12; Field trip logs available [road log to the San Francisco Bay area, Field trip to the Ione clay area], p. 12. **No. 5, May, 8 pp., 5 illus., contains:** Pleistocene lakes of southeastern California—2, by Robert P. Blanc and George B. Cleveland, pp. 1-6, 1 map, 4 photos; Gold and money booklet, p. 7; U.S.G.S. open file releases, p. 7; Staff changes, p. 8. **No. 6, June, 12 pp., 10 illus., contains:** Plutonic rocks, by Charles W. Chesterman, pp. 1-8, 5 illus.; U.S.G.S. open file releases, p. 8; Surface rights determination, p. 9, 3 maps; Selected list of publications on engineering geology of the San Francisco Bay area, pp. 10-11; Westwood geologic sheet available, p. 11, map; Legal guide now available, p. 12. **No. 7, July, 8 pp., 6 illus., contains:** The mineral kingdom—historical review, by Melvin C. Stinson, pp. 1-5, 2 photos; Surface rights determination, p. 6, 3 maps; Lands open to mineral location, p. 6, 1 map; California lands, p. 7; Supplement to Minerals of California, p. 8. **No. 8, August, 16 pp., 6 photos, contains:** The mineral kingdom, by Melvin C. Stinson, pp. 1-16, 6 photos; Land in Solano County opened to mineral location, p. 16; Mineral Information Service worldwide, p. 16.

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  - Bureau of Mines
  - Bureau of Public Roads
  - Bureau of the Census
  - Department of the Interior Central Library
  - Federal Power Commission
  - Geological Survey
  - Library of Congress
  - Securities and Exchange Commission
  - Smithsonian Institution
  - Tariff Commission

FLORIDA

Gainesville
- University of Florida Library

Tallahassee
- Florida Geological Survey
- Florida State University Library

GEORGIA

Atlanta
- Department of Mines, Mining and Geology

Emory
- Emory University, Department of Geology

HAWAII

Honolulu
- U. S. Geological Survey, Ground Water Branch

IDAHO

Boise
- Idaho Inspector of Mines

Moscow
- Idaho Bureau of Mines and Geology

Pocatello
- Idaho State College Library

ILLINOIS

Carbondale
- Southern Illinois University Library

Chicago
- Chicago Natural History Museum
- John Crerar Library
- Midwest Inter-Library Center
- University of Chicago Library

Elsah
Principia College Library
Evanston
Northwestern University Library
Urbana
Illinois State Geological Survey Library
University of Illinois Library

INDIANA

Bloomington
Indiana Geological Survey
Indiana University Geology Library
Indiana University Library
Greencastle
Depauw University Library
Indianapolis
Indiana State Library
Lafayette
Purdue University Library
Notre Dame
University of Notre Dame Library

IOWA

Ames
Iowa State College Library
Iowa City
Iowa Geological Survey
State University of Iowa Library

KANSAS

Lawrence
University of Kansas Library
State Geological Survey of Kansas
Wichita
University of Wichita Library

KENTUCKY

Lexington
Kentucky Geological Survey
University of Kentucky, Margaret I. King Memorial Library
Louisville
University of Louisville Library

LOUISIANA

Baton Rouge
Louisiana Geological Survey
Louisiana State University, Geology Library
Lafayette
Southwest Louisiana Institute, Stephens Memorial Library
Lake Charles
McNeese State College Library
New Orleans
State Department of Conservation, Minerals Division
Tulane University, Department of Geology
Ruston
Louisiana Polytechnic Institute Library

MARYLAND

Baltimore
Enoch Pratt Free Library
Johns Hopkins University, Geology Department Library

MASSACHUSETTS

Boston
Boston Public Library
Boston University, College of Liberal Arts Library
Harvard University, Graduate School of Business Administration, Baker Library
Massachusetts State Library
Cambridge
Harvard University, Museum of Comparative Zoology Library
Massachusetts Institute of Technology Library
Northampton
Smith College Library
Williamstown
Williams College Library

MICHIGAN

Ann Arbor
University of Michigan General Library
East Lansing
Michigan State College Library
Houghton
Michigan College of Mining and Technology Library
Lansing
Geological Survey Division

MINNESOTA

Minneapolis
Minneapolis Public Library
University of Minnesota Library
St. Paul
James Jerome Hill Reference Library

MISSISSIPPI

Hattiesburg
Mississippi Southern College, Geology Department
State College
Mississippi State College Library
University
Mississippi Geological Survey
University of Mississippi Library

MISSOURI

Columbia
University of Missouri Library
Kansas City
Kansas City Public Library
Linda Hall Library

Rolla
Division of Geology Survey and Water Resources
Missouri School of Mines and Metallurgy Library

St. Louis
St. Louis Public Library
St. Louis University, Institute of Technology Library
Washington University, Department of Geology Library

MONTANA

Butte
Montana School of Mines Library
Montana Bureau of Mines and Geology

Missoula
Montana State University Library

NEBRASKA

Lincoln
Conservation and Survey Division
University of Nebraska Library

NEVADA

Boulder City
U. S. Bureau of Mines

Carson City
Nevada State Inspector of Mines

Reno
Nevada Bureau of Mines
University of Nevada, Mackay School of Mines Library
U. S. Bureau of Mines

NEW HAMPSHIRE

Hanover
Dartmouth College Library

Durham
State Planning and Development Commission, Mineral Resources Division

NEW JERSEY

New Brunswick
Rutgers University Library

Newark
Rutgers University, Newark Colleges Library

Princeton
Princeton University Library

Trenton
Bureau of Geology and Topography

NEW MEXICO

Albuquerque
University of New Mexico

Santa Fe
New Mexico Mining Association

Socorro
Bureau of Mines and Mineral Resources
New Mexico Institute of Mining and Technology Library

NEW YORK

Albany
New York State Library
New York State Museum and Science Service

Buffalo
Buffalo Society of Natural Sciences

Endicott
Harpur College, Geology Department Library

Hamilton
Colgate University Library

Hempstead
Hofstra College Library

Ithaca
Cornell University Library

New York
American Geographical Society
American Museum of National History Library
American Petroleum Institute
Columbia University Libraries
Engineering Societies Library
Geological Society of America
Mining and Metallurgical Society of America
New York Academy of Sciences
New York Public Library

Syracuse
Syracuse University Library

NORTH CAROLINA

Chapel Hill
University North Carolina Library

Durham
Duke University Library

Raleigh
North Carolina State College, D. H. Hill Library
Division of Mineral Resources

Statesville
Paleontological Research Laboratory

NORTH DAKOTA

Fargo
North Dakota Agricultural College Library

Grand Forks
North Dakota Geological Survey

OHIO

Athens
Ohio University Library

Bowling Green
Bowling Green State University Library

Cincinnati
Cincinnati Public Library
University of Cincinnati Library

Cleveland
Cleveland Museum of Natural History
Cleveland Public Library

Columbus
Battelle Memorial Institute Library
Ohio Division of Geological Survey
Ohio State University Library
Engineering Experiment Station

Oberlin
Oberlin College Library

Oxford
Miami University Library

Toledo
Toledo Public Library

OKLAHOMA

Bartlesville
U.S. Bureau of Mines Library

Norman
Oklahoma Geological Survey
University of Oklahoma, Geological Library

Oklahoma City
Oklahoma City Carnegie Library

Stillwater
Oklahoma A & M College Library

Tulsa
Tulsa Public Library
University of Tulsa Library

OREGON

Albany
U.S. Bureau of Mines

Ashland
Southern Oregon College of Education Library

Corvallis
Oregon State College Library

Eugene
University of Oregon Library

Portland
Library Association of Portland
Department of Geology and Mineral Industries
Portland State College Library
Raw Materials Survey Library

PENNSYLVANIA

Bethlehem
Lehigh University Library

Bryn Mawr
Bryn Mawr College Library

Easton
Lafayette College, Van Wickle Library

Harrisburg
Topographic and Geologic Survey

Lancaster
Franklin and Marshall College Library

Lewisburg
Bucknell University, Department of Geography and Geology

Philadelphia
Franklin Institute Library
Free Library of Philadelphia
Philadelphia Academy of Natural Sciences Library
University of Pennsylvania Library

Pittsburgh
Carnegie Library of Pittsburgh
National Speleological Society Library
U.S. Bureau of Mines Library

University Park
Pennsylvania State University, Mineral Industries Library

RHODE ISLAND

Providence
Brown University Library

SOUTH CAROLINA

Columbia
Division of Geology, State Development Board

SOUTH DAKOTA

Rapid City
South Dakota School of Mines and Technology Library

Vermillion
State Geological Survey

TENNESSEE

Knoxville
University of Tennessee Library

Nashville
Division of Geology
Joint University Libraries

Norris
U.S. Bureau of Mines

TEXAS

Abilene
Hardin-Simmons University Library

Austin
University of Texas, Bureau of Economic Geology
University of Texas Library

College Station
Texas A & M College Library
Texas Engineers Library

Dallas
Dallas Public Library
Southern Methodist University, Fondren Library

El Paso
El Paso Public Library
Texas Western College Library

Fort Worth
Fort Worth Public Library
Texas Christian University, Mary Couts Burnett Library

Houston
Houston Public Library
Rice Institute, Fondren Library
University of Houston Library

Lubbock
Texas Technological College Library

Waco
Baylor University Library

UTAH

Logan
Utah State Agricultural College Library

Provo
Brigham Young University Library

Salt Lake City
University of Utah Library
U.S. Bureau of Mines Library
U.S. Geological Survey

VERMONT

Burlington
Vermont Geological Survey

Middlebury
Middlebury College, Department of Geology and Geography Library

VIRGINIA

Blacksburg
Virginia Polytechnic Institute Library

Bluemont
U.S. Bureau of Mines

VIRGINIA

Charlottesville
Division of Mineral Resources
University of Virginia, Geology Library

Lexington
Washington and Lee University, Geology Department Library

WASHINGTON

Olympia
Division of Mines and Geology

Pullman
State College of Washington Library

Seattle
Seattle Public Library
University of Washington, College of Mines Library
University of Washington Library

Spokane
Spokane Public Library

Tacoma
College of Puget Sound Library
Tacoma Public Library

WEST VIRGINIA

Morgantown
Geological and Economic Survey

WISCONSIN

Madison
University of Wisconsin Library
Geological and Natural History Survey

Milwaukee
Milwaukee Public Library

WYOMING

Laramie
Geological Survey of Wyoming

PUERTO RICO

Hato Rey
Puerto Rico Geological Survey

FOREIGN

ARGENTINA

Buenos Aires
Direccion General de Minas y Geologia
Museo Argentino de Ciencias Naturales

Jujuy
Universidad de Tucuman, Instituto de Geologia y Mineria

Mendoza
Muse de Historia Natural Juan C. Moyano

Salta
Direccion Provincial de Mineria

AUSTRALIA

Adelaide
Adelaide Public Library
Director of Mines, South Australia
University of Adelaide, Barr Smith Library

Brisbane
Queensland Department of Mines
Queensland Geological Survey
University of Queensland, Engineering School Library

Canberra
Australian Bureau of Mineral Resources

Hobart
Director of Mines, Tasmania
Kalgoorlie
Western Australia Chamber of Mines
Melbourne
Australian Institute of Mining and Metallurgy
Commonwealth Scientific and Industrial Research Organization
Newcastle
Newcastle Technical College Library
Perth
Western Australia Geological Survey
Sydney
The Australian Museum
New South Wales Geological Survey
Public Library of New South Wales
University of Sydney Library

AUSTRIA

Vienna
Geologische Bundesanstalt

BELGIUM

Brussels
Institut Royal des Sciences Naturelles
Tervuren
Musée de Congo Belge

BOLIVIA

La Paz
Regional Institute of Geology, University of San Andres

BRAZIL

Rio de Janeiro
Departmento Nacional da Produção Mineral
Universidade do Brasil, Museu Nacional

BURMA

Rangoon
Burma Geological Department

CANADA

Halifax
Nova Scotia Minister of Mines
Kingston
Queens University Library
Montreal
Canadian Institute of Mining and Metallurgy
Ottawa
Department of Mines and Technical Surveys, Mines Branch Library
Geological Survey of Canada Library
The Royal Society of Canada
Quebec
Laval University, Faculty of Sciences
Saskatoon
University of Saskatchewan Library
Toronto
Ontario Department of Mines
University of Toronto Library
Vancouver
Geological Survey of Canada, British Columbia Office
University of British Columbia Library
Vancouver Public Library
Victoria
British Columbia Department of Mines
Winnipeg
Manitoba Department of Mines and Natural Resources

CHILE

Santiago
Instituto de Investigaciones Geologicas
University of Chile, School of Geology Library

CHINA

Taipeh
Geological Society of China
National Taiwan University, Department of Geology

COLOMBIA

Bogota
Servicio Geologico Nacional
Bucaramanga
Universidad Industrial de Santander

CZECHOSLOVAKIA

Bratislava
Geologický Ústav Dionýza Štúra
Prague
Ustredni Ústav Geologický

EGYPT

Cairo
Ain Shams University

FIJI

Suva
Geological Survey

FINLAND

Helsinki
Suomalainen Tiedeakatemia

FRANCE

Aix-en-Provence
Université d'Aix Marseille, Laboratoire de Géographie
Paris
Centre National de la Recherche Scientifique
Ecole Nationale Supérieure des Mines

GERMANY

Berlin
- Free University of Berlin Library
- Mineralogisches Institut

Bonn
- Geographisches Institut der Universität Bonn

Freiburg
- Naturforschende Gesellschaft

Gőttingen
- Niedersachsische Staats-und Universitätsbibliothek

Hamburg
- Hamburg Geologisches Staatsinstitut

Hanover
- Niedersachsiches Landesamt für Bodenforschung

Kiel
- Geologische-Landesamt Schleswig-Holstein Universitäts-Bibliothek

Kiel-Wik
- Institut für Weltwirtschaft

Krefeld
- Geologisches Landesamt Nordrhein-Westfalen

Wiesbaden
- Hessisches Landesamt für Bodenforschung

GREAT BRITAIN

Cambridge
- University of Cambridge, Department of Geology

London
- Geological Society Library
- Great Britain Geological Survey and Museum
- Imperial College, Department of Geology
- Institution of Mining and Metallurgy
- Institution of Mining Engineers
- National Coal Board Library
- Overseas Geological Surveys
- Patent Office Library
- Science Museum Library

Sheffield
- University of Sheffield, Department of Geology Library

Swansea
- University College of Swansea, Department of Geology

GREECE

Athens
- Institute for Geology and Subsurface Research

HUNGARY

Budapest
- Magyar Tudomanyos Akademia Konyvtara

Miskolc
- Technical University of Heavy Industries

INDIA

Bangalore
- Mysore Geologists Association

Calcutta
- Geological Survey of India

Dhanbad
- Indian School of Mines and Applied Geology

Hubli
- B. V. Bhoomraddi College of Engineering and Technology

Karaikudi
- Alagappa College Library

New Delhi
- Indian Bureau of Mines

ISRAEL

Jersusalem
- The Geological Institute

ITALY

Ferrara
- University of Ferrara, Institue of Geology

Milan
- Università di Milano, Instituto di Geologia, Paleontologia e Geografia Fisica

Rome
- Consiglio Nazionale delle Ricerche

JAPAN

Fukuoka
- Kyushu University, Faculty of Science Library

Kawasaki
- Geological Survey of Japan

Kumamoto
- Kumamoto University Library

Sendai
- Tohoku University, Institute of Geology and Paleontology

Shizuoka
- Shizuoka University, Geological and Paleontological Institute

Tokyo
- National Science Museum Library
- Science Council of Japan
- Tokyo University, Geological Institute Library
- Tokyo University of Education, Geological and Mineralogical Institute

KOREA

Seoul
- Geological Survey of Korea

MEXICO

Mexico City
- Consejo de Recursos No Renovables
- Direccion General de Minas y Petroleo
- Instituto Geologia de Mexico

MOROCCO

Rabat
- Service Géologique du Maroc

NETHERLANDS

Delft
- Netherlands Geological and Mining Society Library

NEW ZEALAND

Auckland
- University of Auckland, Department of Geology

Dunedin
- University of Otago Library

Lower Hutt
- Geological Survey Office

Wellington
- Mines Department
- Royal Society of New Zealand

NICARAGUA

Managua
- Servicio Geologico Nacional

NORTHERN IRELAND

Belfast
- Geological Survey of Northern Ireland

NORTHERN RHODESIA

Lusaka
- Geological Survey Department

NORWAY

Oslo
- Norsk Geologisk Forening, Mineralogisk-Geologisk Museum Library
- University of Oslo, Department of Geography

PAKISTAN

Lahore
- Government College of Engineering and Technology, Department of Mining Engineering

PERU

Lima
- Cuerpo de Ingenieros de Minas del Peru
- Direccion de Minas y Petroleo

PHILIPPINES

Manila
- Bureau of Mines

POLAND

Krakow
- Polskie Towarzystwo Geologiczne

Warsaw
- Geological Survey of Poland
- Polish Academy of Sciences

PORTUGAL

Coimbra
- Museu e Laboratorio Mineralogico da Universidade de Coimbra

RUMANIA

Bucharest
- Institutul de Documentare Tehnică

Jassy
- Polytechnic Institute

SOUTH AFRICA

Capetown
- University of Capetown, Department of Geology

Johannesburg
- Geological Society of South Africa
- Johannesburg Public Library
- Transvaal Chamber of Mines

Pretoria
- South Africa Geological Survey

SOUTHERN RHODESIA

Bulawayo
- National Museum of Southern Rhodesia

Salisbury
- Southern Rhodesia Geological Survey

SPAIN

Barcelona
- Real Academia de Ciencias y Artes de Barcelona
- Universidad de Barcelona, Instituto Geologico
- Universidad de Barcelona, Departamento de Cristalografia y Mineralogia

Oviedo
- Instituto de Geologia

SWEDEN

Stockholm
- Sveriges Geologiska Undersökning

Uppsala
- Universitets Biblioteket

SWITZERLAND

Bern
- Universität Bern, Mineralogisch-Petrographisches Institut

Lausanne
- University of Lausanne, Geophysical Laboratory

TURKEY

Ankara
Mineral Research and Exploration Institute of Turkey

UNION OF SOVIET SOCIALIST REPUBLICS

Leningrad
Academy of Sciences of the USSR Library

Lvov
Geological Society of Lvov

URUGUAY

Montevideo
Instituto Geologico

VENEZUELA

Caracas
Ministerio de Fomento, Direccion de Industria

WEST INDIES

Kingston, Jamaica
Geological Survey Office

YUGOSLAVIA

Ljubljana
Faculty of Mining, Metallurgy and Chemical Technology of Ljubljana

Zagreb
Institute of Petroleum

FINDING LIST OF AUTHORS

Abbreviations used in the finding list are: M, miscellaneous maps; OM, oil field maps; SP, special publications; PR, preliminary reports; RM, register of mines; R, reports of the State Mineralogist; J, California Journal of Mines and Geology; AR, annual reports of the State Oil and Gas Supervisor; B, bulletins; SR, special reports; MIS, Mineral Information Service.

A

Aaron, C. H.: R 6b; 8
Adams, J. M.: R 6b
Albers, J. P.: SR 14; 29; MIS 10-8
Alf, Raymond M.: R 39b
Allen, Alice S.: B 118c
Allen, Clarence R.: B 170r-20
Allen, H. B.: B 118c
Allen, John Eliot: R 37a; B 133
Alvey, Glen: B 152
Anderson, Alden. R 26d
Anderson, Charles A.: R 35c; 56; 57
Anderson, Frank M.: R 28c; B 118b,c
Anderson, Winslow: B 1
Angel, Myron: R 10
Arkley, R. J.: SP 28
Armstrong, J. F.: RM 6
Attwood, Melville: R 2; 5; 8
Atwill, E. R.: B 118c
Aubury, Lewis E.: SP 14; 15; 16; 17; B 53; 56; 57; 60
Aubury, Marion: RM 19
Augur, Irvin V.: AR 3-4; 5-10, 11
Aune, Quintin A.: M 29; MIS 13-8
Averill, Charles Volney: R 24c,d; 25a,b, c,d; 27a,b; 29a; 30c; 31c; 32d; 33b; 34b,c; 35b; 37a,b,d; 38a; 39a,b,c,d; 40d, J 43a,d; 46b; 47b; B 135; 139; 141; 142; 154-5; 156-1
Averitt, Paul: R 41b

B

Baddley, E. R.: B 170r-29
Bailey, Edgar H.: R 42c; J 43a; 52a; B 147; 154-5; SR 17
Bailey, Gilbert E.: SP 12; RM 11; B 24
Bailey, Harry P.: B 170b-2
Bailey, Thomas L.: B 170c-6,r-4
Bailey, William C.: B 118c
Bain, H. Foster: B 130
Ballantyne, Richard S.: B 118c
Ballou, F. H. Jr.: J 47a
Bandy, Orville L.: B 170p
Barnes, George E.: R 9
Barnes, Roy M.: AR 6-12; 7-8; 8-1, 7, 8, 12; 9-2, 8; B 118c
Baroch, Charles T.: R 55; J 54a
Barshad, Isaac: B 169c
Barton, William R.: R 55; 56; J 54a
Bateman, Paul C.: R 41d; J 46a; 52d; 54a; B 170i-4,r-11; SR 47
Bates, Thomas F.: B 169d
Bauer, Roy M.: B 118a
Baughman, Will: R 23c
Bean, R. T.: B 170f-3
Bear, Ted L.: B 170c-8,j-1,4
Beckwith, H. T.: B 118c
Behr, Hans C.: B 9
Bell, H. W.: AR 3-5; 5-8, 10
Benioff, H.: B 171c; MIS 5-9
Bilbrey, Joseph H. Jr.: R 56
Birkhauser, Max: B 118c
Birman, Joseph H.: B 170f-6
Bishop, O. M.: R 55; 56; J 54a
Blackmar, Charles A.: RM 13
Blackwelder, Eliot: R 28c; B 170f-2,5
Blake, William P.: SP 2; R 2
Blanc, Robert P.: MIS 14-4,5
Blodget, W. M.: AR 5-9
Boalich, E. S.: PR 3; 4; 5; 7; R 17; 18; B 64; 65; 68; 77
Bodenlos, Alfred J.: J 46b; B 154-5
Boezinger, H.: AR 10-1
Bongard, J. F.: M 16
Bonilla, M. G.: SR 57
Booth, Edward: R 1
Borden, Granville S.: B 118a
Bowen, Oliver E. Jr.: SP 32; J 53a; B 141; 142; 154-3, 5; 7; 155; 156-3; 165; 170r-18; 176; SR 56
Bowers, Stephen: SP 11; R 8; 9; 10
Bowes, Glenn H.: AR 13-3; B 118c
Bowles, Edgar: B 152
Bowles, Oliver: J 45b
Bowman, J. N.: B 154-1
Boyd, James: J 46c
Bradley, Philip R. Jr.: B 130
Bradley, Walter W.: R 14b,d; 15e; 18; 20d; 22d; 24,d; 25; 26,a,d; 27; 28,a,c; 29; 30,c; 31,c; 32,d; 33; 34,c,d; 35; 36,d; 37; 38,c; 39; 40,d; 41,d; 42,a,c; AR 5-12; B 71; 73; 76; 78; 79; 83; 86; 88; 90; 93; 94; 96; 97; 100; 130; 131
Bramel, Hadley R.: B 130; 144
Brandt, W. O.: J 52b
Bransford, James C.: R 38b
Braun, Lewis T.: J 47c; 48a; B 156-2, 3,4; SR 23
Brice, James C.: B 166
Bridge, A. F.: AR 13-10
Briggs, H. L.: AR 5-9
Briggs, Louis I. Jr.: B 167
Briggs, Revoe C.: B 171b
Brindley, George W.: B 169b,d
Brogie, Ralph I.: J 52b

Brooks, Baylor: B 170r-23
Brown, C. C.: AR 11-9
Brown, G. Chester: R 14d,f
Brown, J. A.: R 10
Browne, Ross E.: R 9; 10
Bryan, Everett N.: R 28a
Buehrer, T. F.: B 169e
Buell, Joseph W.: R 13
Burch, Alfred: R 36b
Burchard, Ernest F.: B 129n
Burgess, John A.: B 141
Burgess, Mary-Louise: SP 20; J 44d; 47b
Burnett, John L.: M 36; MIS 13-5
Burnham, C. Wayne: B 170h-7
Burrell, Logan: AR 8-7
Busch, Phillip M.: R 55; 56; J 54a
Bush, Reed D.: SP 31; R 20; 21a,b,c,d; 22a,b,c,d; 23a,b,c,d; 24a,b,c,d; 25a,b,c,d; 26a,b,c,d; 27a,b,c,d; 28a,b,c; 29a,b; 30a,b,c; 31a,b,c,d; 32a,b,c,d; 33a,b; AR 1-6; 2-1, 4; 3-1, 7; 5-9; 9; 9-8; 10; 10-8; 11; 11-1, 8, 9; 12; 2-5, 8, 9; 13; 13-8; 14; 14-8; B 118a
Bush, Vincent R.: SR 57
Buwalda, John P.: B 170c-9; 171b; MIS 5-9
Byerly, Perry: B 154-3

C

Callaway, H. M.: R 55; 56
Campbell, Ian: R 56; 57; B 170h-6; MIS 12-12
Canfield, Charles R.: B 118c
Carlisle, Donald: B 170i-5; SR 50
Carlson, Denton W.: J 48c; 50a; 51b; 52c,d; B 176
Carter, Frank B.: B 170j-3
Case, J. B.: AR 5-4, 5; 6-11; 7-9; 8-7, 11; 9-4, 6; 13-5; 14-3, 6
Castello, W. O.: PR 4; 5; 7; R 17; B 87
Cater, Fred W. Jr.: B 134, a1, 2, c1, c2, c4
Chambers, L. S.: B 118c
Chandler, Henry P.: R 55; 56; J 54a
Chandler, John W.: R 37c
Chandra, Deb K.: SR 67
Chaney, Ralph W.: R 28c; B 154-4
Charles, Abbott: J 43b
Cheney, Richard L.: MIS 2-9
Chesterman, Charles W.: SP 32; R 38c; J 46a; B 154-5; 156-3,4; 168; 170i-7; 174; 176; SR 10B, C; MIS 14-6
Church, C. C.: R 27b; B 118b
Clark, Bruce L.: B 118b
Clark, Douglas: R 29a
Clark, Lorin D.: SR 40
Clark, William B.: J 50a; 50c; 51a; 52c,d; B 176; MIS 13-6
Clements, Thomas: B 118c
Cleveland, George B.: SP 28; J 52b; 54c; B 176; SR 50, 64; MIS 14-4,5
Cloud, William K.: B 171c; SR 57
Cloudman, H. C.: R 15f
Cogen, William M.: R 32d
Coghlan, S. R.: B 130
Colby, William E.: J 44c; 45c; 46d
Collins, Beth: SP 20; J 44d; 47b; B 170
Collins, F. W.: B 135
Collom, R. E.: R 18; 19; AR 1-5; 2-3; 3-2; 6; 6-7, 8, 9, 12; 7; 7-1, 2, 5, 8, 11; 8; 8-2, 7, 8; 9; 9-2, 3
Comstock, H. B.: R 55; 56; J 54a
Cook, Earl F.: MIS 12-12
Cooper, A. S.: SP 10; B 16
Cooper, H. N.: B 31
Cooper, J. G.: SP 8; R 7; 9; B 4
Copp, W. W.: AR 7-6, 7; 8-3, 10; 9-5, 8; 13-3
Corey, William H.: B 170d-8
Corgan, J. A.: R 55; 56
Cox, Doak C.: B 152
Cox, Manning W.: B 144
Crandall, Richard R.: B 118c
Crawford, J. J.: R 12; 13
Creasey, S. C.: R 42a; B 152
Crippen, Richard A. Jr.: J 43a; 44c; B 141; 154-3, 7; 156-4; SR 10A
Crittenden, Max D. Jr.: B 152; 157
Crook, Theo H.: B 125; 152
Crosby, James W. III: J 47b,d; B 156-4
Cross, Charles M.: B 118c
Cross, Rodman K.: B 118c
Crossman, James H.: R 9
Crowell, John C.: B 170e-6; r-7; SR 24
Cservenyak, F. J.: R 55
Curry, H. Donald: B 170e-7
Curtis, G. H.: SR 54
Cutter, Donald C.: B 141

D

Dana, Edward S.: R 5
Davidson, A. V.: RM 7
Davidson, J. M.: RM 3
Davis, C. W.: R 38b
Davis, D. L.: SR 51
Davis, Dudley L.: B 170i-5
Davis, E. F.: B 152
Davis, Eugene L.: B 118c
Davis, Fenelon F.: R 51d; 54a,d; 55; 56; 57; J 44b; 46b; 47b,d; 48c,d; 50a,b; B 139; 142; 156-1, 3; 176; MIS 12-11; 13-2, 10; 14-3
Davis, G. H.: B 171b
Davis, Hubert W.: R 55; J 54a
Davis, Lannes E.: B 169c
Davis, William Morris: R 29a; J 44 b
De Groot, Henry: R 2; 4; 9; 10
DeHuff, Gilbert L. Jr.: R 55; 56; J 54a
de Polo, Taber: R 55; 56
Dehlinger, Peter: SR 26
Dibblee, T. W. Jr.: B 118c; 150; 160; 168; 170c-2,r-13; 171b
Dietrich, Waldemar Fenn: B 99
Dietz, R. S.: J 46a; 51c
Dittmar, M. E.: RM 10
Dodd, Charles G.: B 169d

Dodd, Harold V.: AR 8-5; 12-4
Dodge, John F.: B 118a
Doell, E. C.: B 118c
Dolbear, Samuel H.: R 36b; B 130
Dolman, S. G.: R 40a; AR 13-12
Donnelly, Maurice: R 30c
Doolittle, J. E.: B 36
Dougherty, John H.: AR 5-5
Douglas, James M.: B 118c
Dow, D. H.: B 134 b1, c4
Downs, Theodore: B 170d-6
Dreyer, Frank E.: B 118b,c
Driver, Herschel L.: AR 10-3; B 118c
Droste, John B.: SR 69
Drury, Frederick W. Jr.: MIS 7-10
Dudley, Paul H.: R 31d; B 118c; 170r-34
Dunn, Russell L.: R 8; 9; 11; 12
Durham, David L.: B 170r-5
Durham, J. Wyatt: B 170d-4,7
Durell, Cordell: R 39b; 40d; B 129*l*; 170r-8; SR 32; 39

E

Eakle, Arthur S.: R 15a; B 67; 91
Eaton, J. E.: R 35c; B 118b,c
Eckel, Edwin B.: R 37d; 42b
Eckel, Edwin C.: R 29b
Edman, J. A.: RM 2; 20; B 45
Edwards, Everett C.: B 118c
Egenhoff, Elisabeth L.: SP 20; J 44d; 45d; 47b; 48b; 49c; B 118c,d; 129; 144; MIS 11-12; 13-3
Eilertsen, Donald E.: R 55; 56; J 54a
Eipper, William E.: J 46c
Eliel, Leon T.: R 26a
Elliott, D. H.: SR 15
Elliott, J. E.: AR 8-1
Ellsworth, Elmer W.: R 29a
Emery, K. O.; J 46a,b; B 170c-7,p
Engel, René: B 146
Eric, John H.: J 46a; B 144; SR 41
Erickson, Max P.: J 46a
Erwin, Homer D.: R 30a; 32d; 36c
Evans, James R.: MIS 13-9
Everhart, Donald L.: R 42b; J 44c; 46c,d; B 159
Evernden, J. F.: SR 54

F

Fairbanks, Harold W.: R 10; 11; 12; 13
Farmin, Rollin: R 37b
Faust, P. H.: MIS 3-1
Fenenga, Franklin: B 141
Ferguson, Glenn C.: B 118b,c
Ferguson, R. N.: AR 2-3; 3-6; 5-1, 3, 6; 7-3
Feuchsel, C. F.: R 42d
Fiedler, William Morris: R 40b
Finch, John Wellington: R 32c; 35a; 36a
Fine, Spencer F.: B 170r-28
Finley, Dozier: J 47c; MIS 4-1
Fisher, Frank L.: R 55; 56
Fix, Philip F.: R 45a
Follansbee, G. S. Jr.: B 118c
Foote, Arthur B.: R 37c
Foote, Arthur De Wint: R 13
Forbes, J. McLaren: R 39c
Forrest, Lesh C.: B 118b
Forstner, William: B 27
Fowle, Royal E.: B 133
Franke, Herbert A.: R 26a,d; 28b; 30b; 31d; 32c
Fraser, Donald McCoy: R 27d
Fraser, H. J.: R 38c

G

Gale, Hoyt S.: R 42d; SR 13
Galliher, E. Wayne: R 28a
Galloway, John: B 118c
Gardiner, Chester M.: B 118c
Gardner, Dion L.: R 36c; B 170i-6
Gardner, E. D.: R 33a; 35c
Gary, George L.: R 35d; 36a; 37b,c,d; 39b; B124; MIS 12-9
Gay, Thomas E. Jr.: M 29; 34; J 49a; 50c; B 146; 170r-12; 176
Gaylord, E. G.: AR 8-7
Gealey, William Kelso: B 161
Gentry, A. W.: B 118c
Gester, S. H.: B 118c
Godde, H. A.: AR 8-4, 9; 9-5; 10-5, 8; 11-8; 12-1, 8, 11; 13-6, 8; 14-1, 8
Goldman, Harold B.: SP 30; J 52a; 54b,d; 57; B 176; 180A; SR 55; 70; MIS 12-12
Goldstone, L. J.: R 10
Goodrich, H. R.: MIS 2-4
Goodwin, J. Grant: J 53b; 54c; B 166; 176
Goodyear, W. A.: R 7; 8; 9; 10
Gore, F. D.: R 19d; AR 7-9; 8-6,8; 9-8
Goudkoff, Paul P.: B 118b
Graham, Joseph J.: SR 66
Grant, Ulysses S. (IV): R 35a; B 118b,c; 170c-4,k-3
Grant, William M.: R 18b
Graser, F. A.: AR 11-11; 12-12
Graves, Doyle T.: B 170r-32
Gray, Cliffton H. Jr.: J 53a; B 170r-21; 176; 178; SR 55, 65
Gresswell, W. K.: R 36b
Grim, Ralph E.: B 169a,d
Griggs, Allan B.: B 134b2
Grinsfelder, S.: B 118c
Grizzle, M. A.: AR 9-6
Gudde, Erwin G.: B 154-1
Guillou, Robert B.: SR 31
Gumbinner, Sven: R 9
Gunsallus, Brooke L.: R 55; 56; J 54a
Gutenberg, Beno: B 170e-3; 171c; MIS 5-9
Gutschow, N. R.: MIS 3-1
Gutzkow, F.: R 6b
Gwinn, G. Richards: R 40d; 56

H

Hadley, Jarvis B.: B 129a; 152
Haines, Richard B.: B 170r-27
Haley, Charles Scott: R 18a; 19a; B 92
Hall, James L.: J 52b
Hall, Wayne E.: SR 16; 28; 51; MIS 10-8
Ham, Cornelius K.: SR 22
Hamilton, Fletcher McN.: PR 1; 2; 6; 8; R 14; 15; 16; 17; 18; 19; B 66; 70; 75
Hamilton, Warren B.: SR 46
Hammond, John Hayes: R 8; 9; 10
Hammond, R. P. Jr.: R 10
Hanks, Henry G.: R 1; 2; 3; 4; 5; 6
Hanley, John B.: SR 7B
Hanna, G. Dallas: R 18b; 25a; 27b; 32a; AR 10-3; B 118b; 154-5, 7
Harness, Charles L.: R 40a
Harrington, William C.: B 118c
Harris, James C. O.: R 55; 56; J 54a
Harris, Lew B.: RM 20; 21
Harris, Paul B.: B 170r-2
Hart, Earl W.: B 176; SR 45; 58
Harvey, Philip: R 2
Haskell, Dudley: J 48a
Hasson, W. F. C.: R 13
Haury, P. S.: AR 7-4
Hazenbush, George C.: J 47b; 48c; 49a
Hazzard, John C.: R 33d; B 170e-4
Heikkila, Henry H.: SR 6
Heindl, R. A.: R 55; 56; J 54a
Heizer, Ott F.: R 34c
Heizer, Robert F.: R 37b; 40c; B 118a; 141; 154-1; 170b-3; 175
Helm, Mary Helena: R 41d
Hemborg, Harold B.: B 171d
Hendrickson, A. B.: AR 13-7; 14-7
Hendry, N. W.: R 38c
Henny, Gerard: B 118c
Henry, Edward C.: B 169g
Henshaw, Paul C.: R 38b
Herman, John: J 44d
Herold, Stanley C.: B 118a
Herring, Donald G. Jr.: B 170r-30
Hertlein, Leo George: R 35a; B 118b,c; 154-4; 170c-4
Hewett, D. F.: B 129m; 170c-1,e-2
Hewitt, R. L.: J 44b
Heyl, George R.: J 45d; B 144
Hidden, William Earl: R 5
Higgs, Donald V.: B 170h-8
Hilgard, E. W.: R 10
Hill, James H.: R 19d
Hill, Mary Rae: see Rice, Mary Hill
Hill, Mason L.: B 118c; 170e-1; 171b
Hillis, Donuil: B 118c
Hilpert, Lowell S.: R 41a; 42c
Hinds, Norman E. A.: R 29a; B 158
Hobson, H. D.: B 118c
Hobson, J. B.: R 10; 11
Hodson, William G.: R 11
Hoffman, Samuel R.: J 47d; 50c; B 156-4
Hofmann, Walter: B 170g-1,2
Hofstetter, Leonard O.: J 44a
Holliday, Robert W.: R 55; 56; J 54a
Holman, W. H.: B 118c
Honke, Martin T. Jr.: J 46a
Hoots, Harold W.: B 118b; 170c-8,j-1,4
Hoover, Herbert: R 29b
Hoppin, Richard A.: SR 3; 36
Hotz, Preston E.: R 55; 56
Housner, G. W.: B 171d; SR 57
Howard, Arthur David: B 154-2
Howard, Paul J.: AR 14-10; B 118c
Howell, Benjamin F. Jr.: B 170r-10
Hubbard, Henry G.: R 39a,b,c
Hubon, Irving A.: RM 14
Hudson, D. E.: SR 57
Hudson, Frank S.: B 125; 152
Huelsdonk, L. L.: B 135
Huey, Arthur S.: B 140
Huguenin, Emile: PR 7; R 15a,e,f; 17; AR 6-8; 7-8, 9; 9-8, 12; 10-8; 11-8, 12; 12-8; 13-8; 14-8; B 76
Hulin, Carlton D.: R 30c; B 95
Hunt, Charles B.: B 152
Hursh, R. K.: J 52b
Hutton, C. Osborne: SR 59
Hveem, Francis N.: B 169f

I

Ingram, Stuart H.: J 45c
Inman, Douglas L.: B 170f-4
Irelan, Linna: R 9
Irelan, William Jr.: R 6,b; 7; 8; 9; 10; 11
Irving, Donald R.: R 55; 56; J 54a
Irwin, William P.: B 170i-4; 179
Isaacs, John D.: R 13

J

Jackson, A. Wendell: R 7; 8
Jahns, Richard H.: SR 4; 7A; B 170, a,b-1,c-3,6,d-7,h-5,q,r-6
James, L. B.: B 170g-3
Janin, Charles: B 57
Jarman, Arthur: R 23a
Jasper, O. W.: RM 17
Jeffery, Joseph A.: R 27c; 39c
Jenkins, Dorothy G.: B 141; 154-1
Jenkins, Olaf P.: M 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; SP 18; R 26b,c,d; 27a,b,c,d; 28a,b,c; 29a; 30a,c; 31b,d; 32c,d; 33a,b,c,d; 34b,c; 35c,d; 36c,d; 37a,b,c; 38c; 39a,b,d; 40b; 41d; J 43d; 45a; 46a; 47b; 48a; 49a; 50a,c; 52a,d; 54a; B 108; 118b,c; 125; 129; 130; 133; 134; 135; 141; 142; 144; 154; 155; 156; 158; 171; 176; SR 45; MIS 6-4
Jenkins, William O.: R 39b
Jennings, Charles W.: M 28; 30; 31; 32; 33; 34; 35; 36; J 49b; 50b; B 170d-*l*,m; 176; SR 23; 26; 30; 45; 52

Jenny, Hans: B 155
Jensen, Nan C.: R 40a; J 45b
Johnson, A. C.: B 129o
Johnson, A. L.: B 169d
Johnson, Bertrand L. R 37b
Johnson, Charles F.: R 31b
Johnson, F. A.: B 118c
Johnson, F. T.: J 45c
Johnson, Harry R.: B 118c
Johnston, Norris: B 169h
Johnston, Robert L.: B 171d
Johnston, William D.: R 9, 10
Johnston, William D. Jr.: R 33d
Jones, Wendell M.: AR 7-12
Joslin, G. A.: B 130

K

Kaiser, C. L.: AR 9-12; 10-1
Keiser, Edwin T.: R 20c
Kelley, Fred R.: SP 28
Kelley, Vincent C.: R 34d
Kelley, W. P.: B 169d
Kellogg, A.: R 2
Kellogg, John L.: R 35d
Kelly, Junea W.: R 29b
Kennedy, D. O.: R 55; 56; J 54a
Kerr, M. B.: RM 1
Kerr, Paul F.: B 169b
Kett, William F.: J 43b
Kew, W. S. W.: B 118c
Key, W. W.: R 55; 56; J 54a
Keyes, Robert L.: AR 9-4; 10-12; 12-1, 8; 13-8
Keyes, W. S.: R 8
Kiessling, Edmund W.: MIS 13-4
Kildale, Malcolm B.: B 170i-5
King, Clarence R.: J 44b,c,d; B 139
King, Myrle E.: B 169f
King, Vernon L.: B 118c
Kinkel, A. R. Jr.: SR 14; 16; 28; MIS 10-8
Kirby, Edmund B.: R 13
Kirby, James G.: R 55; 56
Kirby, James M.: B 118c
Kirwan, M. J.: AR 1-2, 6; 2-1, 2; 3-3; 5-12
Klein, Ira E.: J 54b; SR 55
Kleinpell, Robert M.: B 118b
Kleinpell, William D.: B 170c-8,j-4
Kluth, Emil: B 118c
Knapp, W. J.: J 52b
Knox, George L.: B 118c
Knutson, Elmo G.: J 54a
Koenig, J. B.: SR 52
Krauskopf, Konrad B.: SR 35
Kribbs, George R.: B 118c
Kroger, Robert Scott: B 125
Krueger, Max L.: B 118c
Krumlauf, H. E.: MIS 13-12
Kundert, Charles J.: M 20; 21; 22; 23; 24; 25; 26; 27; B 176; SR 18
Kunz, George F.: B 37
Kupfer, Donald H.: B 170r-19; 171b

L

Laiming, Boris: B 118b
Laird, Wilson M.: J 45b
Laizure, C. McK: R 17; 18; 19; 20; 21a,b,c,d; 22a,b,c; 23a,b; 24b,d; 25a, b,c,d; 28b; 29c; 30b; 31a; 39a; B 120
Lamar, Richard S.: J 48c; 49b
Lamey, Carl A.: B 129b,c,d,e,f,g,h,j,k
Lance, John F.: SR 4
Langston, Robert B.: J 54b
Lansche, Arnold M.: R 55; 56; J 54a
Larsen, Delmar H.: B 169h
Larsen, Esper S. Jr.: B 159; 170h-3
Larson, Leonard P.: R 55; 56; J 54a
Lasky, S. G.: B 152
Ledingham, Glen W.: B 118c
Leggett, Thomas Haight, R 12
Leith, Carlton James: B 147
Lemmon, Dwight M.: SR 51
Leppla, P. W.: MIS 6-11
Lewis, D. R.: B 169c
Lewis, Walter E.: R 56
Liam, Harold M.: B 170r-25
Lightfoot, William Ewart: SR 12
Lindgren, Waldemar: R 34a
Lindsly, Ben E.: AR 1-6
Linsley, Earle G.: R 35c
Lipson, J.: SR 54
Little, James M.: R 38c
Logan, Clarence A.: PR 7; R 15e; 17; 18; 19; 20; 21a,b,c,d; 22a,b,c,d; 23b,c; 24a,c; 25b,c; 26b,c,d; 27c,d; 31a; 32a, c; 34c; 37c; 39a; J 43c; 45a; 46b,d; 47c; B 76; 85; 108; 127; 138; 141; 142; 156-3, 4
Lohman, L. H.: J 52b
Longwell, Chester R.: B 170f-9
Louderback, G. D.: B 154-2
Lovering, Tom G.: SR 49
Lowden, W. S.: RM 4
Lowell, F. L.: R 14c,d
Lukens, R. R.: R 34a
Lunetta, George: MIS 6-10
Lydon, Philip A.: M 34; B 176; SR 61; MIS 12-8, 11
Lynton, Edward D.: R 34d

M

MacBoyle, Errol: R 16a,b,c
MacEwan, Douglas M. C.: B 169c
MacGinitie, Harry D.: B 118c
Mackenzie, A. G.: R 35b
Mackevett, Edward M.: SR 5; 34; 51
MacLeod, George M.: SR 6
Madeira, George: RM 8
Malozemoff, P.: B 135
Manlove, Charles: B 118c
Mann, John F. Jr.: SR 43
Manning, George A.: B 148
Marks, Jay Glenn: B 118c
Marliave, E. C.: B 170g-3
Marsh, Owen T.: SR 62
Martin, A. J.: J 54a
Mason, A. J.: AR 9-10

Masser, H. L.: AR 8-9
Masson, Peter H.: B 151
Matthews, Philip S.: R 31c
Matthews, Robert A.: MIS 12-9
Maxson, John H.: R 29a
May, John C.: J 44b; B 118c
Mayo, Evans B.: R 26d; 29a; 30a
McAllister, James F.: SR 25; 42
McCabe, R. E.: AR 10-1, 8; 11-8; 12-8; 13-8; 14-8
McCulloh, Thane H.: B 170h-2
McDougal, R. B.: R 55; 56; J 54a
McGill, John T.: B 170k-2
McGillivray, John D.: R 13
McGregor, Alexander: R 10
McGregor, F.: AR 2-1
McInnis, Wilmer: R 55; 56; J 54a
McLaughlin, R. P.: PR 1; 2; RM 11; 16; R 14d; 15a; AR 1; 1-1, 6; 2; 2-1; 3; 3-1; 4; 4-3, 4; 5; 5-1, 2, 4, 6, 7, 8, 9, 11, 12; 6; 6-1, 4; B 69; 73; 82; 84
McMahon, A. D.: R 55; 56; J 54a
McMasters, J. H.: B 118c
McNaughton, Ronald R.: MIS 14-4
McNitt, James R.: MIS 13-3
Means, John H.: B 15
Meek, Jason R.: RM 21
Merriam, Charles W.: B 170d-2
Merriam, Richard: B 159; 170r-22; 177; SR 27
Merrill, Charles White; R 34c; 37a; 55; 56; J 54a
Merrill, Frederick J. H.: R 14e; 15d,f
Merrill, William R.: B 170r-3
Merritt, F. C.: AR 8-1
Messner, Wm. E.: MIS 7-6
Metzner, Loyde H.: B 118c
Michelin, James: B 118c
Mielenz, Richard C.: B 169f
Miller, Jesse A.: J 54a
Miller, Robert H.: B 118c
Miller, William John: R 31b; 36d; 40a
Miller, William P.: R 10
Milliken, T. H.: B 169h
Mills, G. A.: B 169h
Miner, J. A.: R 10
Minshall, Francis E.: B 170r-27
Mispley, R. G.: J 45c
Mitchell, D. W.: J 49b
Mitchell, Stewart: B 171d
Moran, Donald F.: B 171d
Moran, Robert B.: AR 1-4; 6; 2-1
Morse, R. R.: B 152
Muehlberger, William R.: B 170r-6, 16
Muessig, Siegfried: B 171b
Mulryan, Henry: R 32b
Mumford, Russell W.: B 170i-2
Murdoch, Joseph: SP 22; R 40c; 42c; J 45d; B 136; 170h-1; 173
Murdock, J. B.: J 51b
Murphy, F. M.: R 28c
Musser, E. H.: AR 11-3, 5, 11; 12-6, 11; 13-4; 14-4, 5, 8
Myers, W. Bradley: R 42b; J 44c; B 147

N

Nahin, Paul G.: B 169d
Naramore, Chester: AR 1-3, 6
Natland, M. L.: B 170d-5
Nelson, J. M.: B 152
Neuerburg, George J.: SR 33
Neumann, Frank: B 171c
Newman, M. A.: R 18; 19
Noble, Earl B.: B 118c
Noble, James A.: B 170r-14
Noble, Levi F.: B 170-10,e-5
Nolan, E. D.: AR 3-1
Norbeck, H. P.: B 152
Norman, Lewis A. Jr.: SP 22; J 47a,b; B 142; 156-3, 4; 170i-7; SR 3; MIS 5-7
Normile, Thomas: R 18j
North, Edward: R 10

O

O'Brien, John Charles: R 39a,b,c; 42c; J 43d; 44d; 45c; 46c; 47b; 48a,b,d; 49c; B 142; 156-4; 176
Oakeshott, Gordon B.: R 33c; 55; 56; J 45b; 46a; B 129p; 154-5; 156-2, 3, 4; 170d-1,r-9,31; 171,a,b; 172; 176; SR 11; 23; 57; MIS 13-1
Oblad, A. G.: B 169h
Ogle, Burdette A.: B 148; 164
Olmsted, Franklin H.: J 46b
Olson, Jerry C.: B 170i-3
Orcutt, Charles Russell: R 10
Osthaus, Bernard B.: B 169d
Otis, L. M.: R 55; 56; J 54a
Overseth, Oliver E.: MIS 2-7

P

Pabst, Adolf: B 113
Page, Ben M.: SR 8
Page, J. B.: B 169e
Page, Lincoln R.: R 42a
Paone, James: R 55; 56; J 54a
Parker, Frank S.: B 118c; 170j-2
Parker, Ivan H.: RM 9
Parsons, B. E.: AR 8-7
Partridge, John F. Jr.: R 37b
Paschall, Robert H.: B 170r-26
Pask, Joseph A.: J 52b; 54b; B 154-5; 165; 169; SR 19; MIS 5-7, 8
Paul, Almarin B.: R 2
Payne, Max B.: SR 9
Peck, Albert B.: R 20b
Peers, G. A.: B 171d
Pemberton, J. R., B 118a
Penfield, Samuel S.: R 5
Penniman, H. W. H.: RM 1
Pennington, James W.: R 55; 56; J 54a
Perry, O. W.: B 171d
Petar, Alice V.: R 27a
Petersdorff, F. C. von: R 10
Pierce, W. G.: B 152
Poe, Owen J.: B 170d-6
Popenoe, Willis P.: B 118c; 170d-3
Popert, William H.: R 41b

Porter, Lawrence E.: B 118c
Porter, William W. II: B 118c
Pradham, V. S.: J 49b
Pray, Lloyd C.: B 170i-3; 176; MIS 10-6
Preston, E. B.: R 9; 10; 11; B 6
Proctor, Paul Dean: J 46a; B 129l
Prout, John W. Jr.: R 36d
Prutzman, Paul W.: RM 18; B 32; 63
Putnam, William C.: B 170f-7

R

Radbruch, Dorothy H.: B 171d
Ralston, Oliver C.: R 40c
Rand, William W.: R 27b
Randall, P. M.: R 6b
Randol, J. B.: R 6b; 10
Ransome, Alfred L.: R 35d; 36b
Reed, Charles H.: R 35a
Reed, Ralph D.: B 118b
Reese, Richard G.: B 118c
Reiche, Parry: SR 2
Renick, Abbott: J 54
Reno, Horace T.: R 55; 56; J 54a
Rice, Mary Hill: SR 56; MIS 11-12; 13-3
Rice, Salem J.: SP 32; J. 47b; 49c; B 176; MIS 14-1
Richmond, James Frank: SR 21, 65
Richter, Charles F.: B 170e-3,k-1; 171c; MIS 5-9
Ricker, Spangler: R 41a; 45a,c; B 129o; 152
Ricketts, A. H.: R 11; 20b,c,d; 21a; 22c; 25c; 26b; J 44a; 46b; B 98; 106; 120; 123; 127; 138
Ries, Heinrich: J 44a
Rinehart, C. Dean: SR 48
Rist, Robert L.: B 118c
Roberts, D. C.: AR 11-7; 12-10; 13-11
Roberts, Ellis: B 170r-23
Robinson, F. W.: R 2
Rogers, Austin Flint: R 28a; 40d
Rogers, B. L.: B 146; 176
Rogers, John J. W.: B 170r-24; SR 68
Rogers, R. G.: AR 9-12; 10-10; B 118c
Rollins, Robert Z.: B 155
Romanowitz, Charles M.: B 135
Root, Lloyd L.: SP 31; R 19; 20; 21; 22; 23; 24
Rosaire, E. E.: B 118a
Rose, Robert L.: SP 32; SR 60
Ross, Donald C.: SR 48; 53
Rothwell, W. T. Jr.: B 170d-5
Rowland, Richards A.: B 169d
Rubel, Albert C.: AR 9-11
Ruhlman, E. Robert: R 55; 56; J 54a
Russell, R. Dana: R 35c
Ryan, J. P.: R 55; 56; J 54a
Rynearson, Garn A.: B 134a1, c3, c4, 5

S

Sahlberg, Manley W.: SR 57
St. Amand, Pierre: B 171b
Salathe, Frederick: R 13
Sampson, Reid J.: R 25d; 26c; 27c; 28a,b,c; 29b; 31d; 33c,d; 34d; 36a, b,c,d; 37d; 38b; 39a,b,d; 41c; J 45b; B 142
Sanborn, Albert F.: SR 63
Sanborn, Frank: R 22a; 28b; 30b
Sans, Frank J.: B 169d
Saul, L. R.: MIS 13-7
Saul, R. B.: MIS 13-7
Saunders, L. W.: AR 9-12; 10-11; 12-7
Savage, Donald E.: SP 32; B 170d-6,7
Sawin, Herbert A.: B 135
Scarborough, H. L.: B 118a
Schanz, John J. Jr.: MIS 13-8
Scharpenberg, C. C.: AR 3-1
Scheidel, A.: B 5
Schlocker, J.: B 171d
Schmidt, F. Sommer: B 174
Schoellhamer, J. E.: B 170c-5
Schombel, L. F.: B 118c
Schreck, A. E.: R 55; 56; J 54a
Schuette, C. N.: R 33a
Schwade, Irving T.: B 170r-1
Scollon, T. Reed: R 55; 56
Scott, Bernhard H.: AR 13-1
Searls, Robert M.: R 35a; B 130
Sedelmeyer, H. A.: R 27a; B 118b
Segerstrom, Richard J.: R 37d
Senior, Sam P. Jr.: R 25b
Sharp, Robert P.: B 170f-1,3,8
Shedd, Solon: R 35c; B 104; 115
Shelton, Hal: B 158
Shelton, John S.: B 170h-4
Shepard, Francis P.: R 34c
Shepard, O. Cutler: B 125
Sherman, R. W.: B 118c
Shride, A. F.: B 152
Simons, Frank S.: B 125; 129i; 152
Simoons, Frederick J.: J 50b
Simonson, R. R.: B 118c
Simpson, Edward C.: R 30c
Sklar, Maurice: B 171b
Skow, Milford L.: R 55; J 54a
Smith, George I.: B 171b
Smith, James Perrin: B 72
Snedden, Loring B.: B 118c
Somerton, Wilbur H.: J 45b,c,d
Soper, E. K.: R 34b; B 118c
Soske, Joshua L.: B 171b
Soyster, M. H.: AR 5-5; 8; 7-10; 8-8
Sperisen, Francis J.: R 34a
Stalder, Walter: R 39c; B 118a
Stamper, John W.: R 56
Starke, E. A.: AR 3-1
Stein, H. A.: J 51b
Steinbrugge, Karl V.: B 171d; SR 57
Steiny, H. J.: AR 6-10
Stephens, Hal G.: SR 49
Stern, A. George: R 40c
Stetefeldt, C. A.: R 10
Stevens, J. B.: AR 7-4
Stevens, Jay W.: SP 31
Stevens, John B.: B 118c
Stewart, R. E.: B 118c

Stewart, Richard M.: J 47a,b; 49a; 51a; B 142; 156-4; 170i-5; 176; 177
Stinson, Melvin C.: J 53a; B 176; MIS 14-7,8
Stipp, Henry E.: R 55; 56; J 54a
Stipp, T. F.: B 118c
Stirton, R. A.: B 154-4
Stolz, Harry P.: B 118c
Stoner, R. C.: AR 3-1
Storms, W. H.: R 11; 12; B 2; 18
Strand, Rudolph G.: M 31; 33; SR 52
Stromquist, Arvid A.: J 46a; SR 41
Sutherland, J. Clark: R 31a; J 42b; B 130
Suverkrop, Lew: AR 9-7; 10-4; 9; 14-4
Swayze, R. O.: B 118c
Swigart, T. E.: AR 10-7
Swinney, C. Melvin: J 43a; 45a; 46a,c; SR 41
Switzer, George: B 161
Symons, Henry H.: R 26b,c; 28b; 30b; 40c; 55; 56; J 47b; 48d; 50a; 51d; 54a; B 101; 102; 103; 105; 107; 109; 110; 111; 112; 114; 116; 117; 119; 121; 122; 126; 128; 132; 137; 139; 142; 156-1; MIS 12-11

T

Taliaferro, N. L.: B 118b,c; 125; 143; 145; 152; 154-3
Taylor, George F.: RM 15
Terry, Richard D.: SR 44
Thayer, T. P.: B 134 b1
Thayer, W. W.: AR 2-1; 3-1; 5-2; 6-2; 7-2; 8-2
Thomas, F. F.: R 8
Thomas, R. G.: B 170g-3
Thoms, C. C.: AR 6-1, 6, 8; 8-2, 8; 9-8; 11-4, 8, 10; 12-3, 8; 13-8; 14-8, 9; B 118c
Thomson, H. B.: AR 6-6, 11; 7-3, 6, 8, 11; 8-8
Thorndyke, John T.: R 32d
Thorne, W. E.: RM 17
Thorup, Richard R.: B 118c
Tickell, F. G.: AR 6-9; 10-6
Tocher, Don: SR 57
Tolman, Frank B.: B 118c
Trask, Parker Davies: J 54b; B 125; 129i; 152
Trauger, Fred D.: B 152
Travis, Russell B.: B 162
Treganza, Adan E.: R 40c; B 154-1
Tregloan, John B.: RM 12
Tremoureux, Roy E.: B 130
Troxel, Bennie W.: B 170*l*,m,n,r-15; 176; MIS 13-1
Troxell, Harold C.: B 170g-1,2; 171b
Tucker, W. Burling: PR 7; R 14a; 15b,c,f; 17; 18; 19; 20; 21a,b,c,d; 22b,d; 23a,c,d; 25a,d; 26c; 27c,d; 28c; 29b; 30c; 31d; 34a,d; 35a; 36a, b,c,d; 37d; 38b; 39a,b,d; 41c; 42d; J 45b; B 76
Turner, Mort D.: J 47b; 52b; B 154-5; 156-3, 4; 169; 170d-1; SR 19
Tustin, E. B. Jr.: R 42d
Tyler, Paul M.: R 34b

U

Uren, Charles E.: RM 5
Uren, Lester C.: B 118a

V

Valentine, W. W.: B 118c
Van Couvering, Martin: AR 6-2; 7-10; B 118c
Vander Leck, Lawrence: R 18e; AR 4-4; 5-8; B 89
Vanderburg, W. O.: R 31c
VanderHoof, V. L.: B 154-3; 171c
Vaughan, F. E.: B 118a
Vedder, J. G.: B 170c-5
Ver Planck, William E. Jr.: J 46a; 51; 52c; B 142; 154-5; 155; 156-3; 163; 170i-1; 175; 176; MIS 12-10
Vernon, James W.: J 47b, c, d; B 155; 156-2,3,4
Vickery, Frederick P.: B 118c
Vitaliano, Charles J.: J 46c
Vodges, Anthony W.: B 10; 30
Vonsen, M.: R 32a; 42c

W

Wagener, R. A.: AR 7-2; 10-2; 11-2; 12-2; 13-2; 14-2
Wagy, W. W.: AR 8-7
Walker, D. H.: B 51; 52; 54; 55; 58; 59; 61; 62
Walker, George W.: B 134b2; J 45d; SR 1A, 1B; 37; 49
Wanders, H. H.: R 41b
Wardner, William R. Jr.: B 118a
Ware, Glen C.: J 54a
Waring, Clarence A.: M 14; R 15a,b,c, e; B 76
Warne, Archer H.: B 171b
Warner, Thor: R 26a
Warren, Charles R.: B 156
Warren, Earl: J 45c
Waterfall, Louis N.: B 118c
Waterman, Herbert: B 130
Watts, W. L.: R 10; 11; 13; B 3; 11; 19; 20
Weaver, Charles E.: B 118c; 149
Weaver, Donald K.: AR 14-7; B 118c
Webb, Robert W.: SP 22; R 36d; 40c; B 136; 170h-1; 171b; 173
Weber, Adolph H.: R 7; 9
Weber, F. Harold Jr.: MIS 14-2
Wells, Francis G.: B 134a1,2; 154-5
Wells, Ruth: SR 23
Wessel, F. W.: R 55; 56
Wharton, J. B.: B 118c
Wheelan, F. H.: R 10
Wheeler, Henry P. Jr.: R 55; 56
White, George N.: B 171b
Whiting, H. A.: R 8

Whitten, C. A.: B 171b; SR 57
Wicks, Frank R.: R 27a
Wiebelt, Frank J.: J 45a
Wiese, John H.: R 42a; 45d; 46a; B 153
Wilhelm, V. H.: AR 9-6, 9; 10-8; 11-6, 8; 12-5, 6, B 118c
Wilkinson, E. M.: RM 19
Willey, Harry I.: R 9
Williams, Howel: B 151
Williams, R. N.: B 118c
Williams, W. L.: AR 8-4
Willis, Robin: B 118c
Wilmarth, M. Grace: B 118c
Wilmot, R. C.: R 55; 56; J 54a
Wilson, H. D. Jr.: B 171b
Wilson, H. D. B.: R 38c
Wilson, Ivan F.: R 39b; B 125; 152
Wiltsee, E. A.: R 11
Wing, Robert L.: 154-6
Winham, W. P.: B 118c
Winston, W. B.: R 37c; 39b; 41c; J 43b,d; 44a; 45a; B 57
Winter, H. E.: B 118c
Winterburn, Read: B 118c; 170r-33
Winterer, Edward L.: B 170r-5
Wisker, A. L.: R 32b
Wisser, E. H.: J 52b
Wissler, Stanley G.: B118b
Woodford, Alfred O.: R 39c; B 152; 170c-5
Woodhouse, C. D.: R 27c
Woodward, A. F.: B 118c
Woodward, W. T.: B 118c
Worts, G. F. Jr.: B 171b
Wright, Charles Will: R 32b
Wright, Lauren A.: J 44a; 47b; 49a; B 154-5; 155; 156-3; 170c-10,i-7,*l*,r-12,17; 176; SR 7A; 20; 38
Wright, Lawrence B.: R 42a
Wright, Lawson A.: SR 47
Wyant, Donald G.: B 144
Wyllie, M. R. J.: B 169h

Y

Yale, Charles G.: R 6b; 11; B 7; 8; 12; 13; 14; 17; 21; 22; 25; 26; 28; 29; 33; 34; 35; 39; 40; 41; 42; 43; 44; 46; 47; 48; 49
Yates, Lorenzo G.: R 9
Yates, Robert G.: R 41a; 42c
Yerkes, R. F.: B 170c-5
Yoder, H. S.: SR 10C
Young, Umberto: B 118c

Z

Zacher, Edwin G.: SR 57
Ziegler, F. W.: AR 7-7
Zimmerman, Erle C.: J 45d; MIS 2-6

FINDING LIST OF SUBJECTS

Abbreviations used in the finding list are: M, miscellaneous maps; OM, oil field maps; SP, special publications; PR, preliminary reports; RM, register of mines; R, reports of the State Mineralogist; J, California Journal of Mines and Geology; AR, annual reports of the State Oil and Gas Supervisor; B, bulletins; SR, special reports; MIS, Mineral Information Service.

A

Abbott quicksilver mine: MIS 7-10
Abrasives: B 156-3; 176; MIS 3-7
Adamson tungsten mine, Inyo County: R 41d
Adobe brick: MIS 12-7
Adobe houses, San Francisco Bay area: B 154-1
Adsorbent clays, California: J 49b
AEC: see Atomic Energy Commission
Aerial photography
  application to mapping: AR 5-9
  importance to California geologists: R 26a
  see also: Photogeology
Afterthought mine: SR 29
Age-determination of rocks: SR 54
Aggregate
  for concrete: R 40a; J 52a; SR 55
  for new highways: MIS 10-3; 11-7
  lightweight: MIS 7-5
Aggregate industry, San Francisco Bay area: B 154-5
Agriculture, minerals useful to California: B 155; MIS 1-12
Agstone, possible uses in California: R 18c
Airox concrete aggregate: R 40a
ALAMEDA COUNTY
  Delta-Mendota canal, geology: SR 2
  geologic guidebook: B 154
  geology and mineral resources: MIS 2-1
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 17; 25d; J 46b
  Tesla quadrangle, geology: B 140
Alberhill clay deposits, Riverside County. R 19d
Alexander Hills area, geology: B 170r
Alkali-aggregate reaction, in California concrete aggregates: SR 27
Alleghany district, Sierra County, quartz mining in: R 18j; J 52c; MIS 8-2
ALPINE COUNTY: MIS 2-3
  MINES AND MINERAL RESOURCES: R 8; 10; 12; 15a; 17; 18h; 27d
Altitudes, table of California: R 6a; 10
Altoona quicksilver mine, Trinity County: J 46c
Alum: MIS 2-7
Aluminum: R 37c; B 156-4; 176; MIS 10-7
  from anorthosite: MIS 13-7
AMADOR COUNTY: MIS 2-4
  Buena Vista area, geology: SR 19
  chromite: B 134c2
  Electra and West Point tunnels, geology: J 46a
  Grayhouse copper area: B 144
  Ione-Carbondale clays, drilling by U. S. Bureau of Mines: J 45c
  MINES AND MINERAL RESOURCES: RM 12; R 6b; 8; 10; 11; 14a; 17; 23b; J 50a
  Newton copper mine: B 144
  Tertiary volcanic domes near Jackson: SR 60
American Eagle-Blue Moon area, Mariposa County: B 144
American Institute of Mining and Metallurgical Engineers
  Warren address: J 45c
American Potash and Chemical Corp. flow sheet: R 41d
Anacapa Islands: See Channel Islands

Andalusite: R 20b; B 156-3; 176; MIS 4-10
deposits, California: R 27c
Anderson, Charles A.: MIS 12-11
Angeles National Forest, withdrawn areas: J 50c
Angels Camp quadrangle, geology: SR 41
Anhydrite: MIS 6-1
Announcements
California State Division of Mines publications: see under California State Division of Mines, announcements of publications
exhibits: see under Exhibits, announcements of
meetings: see under Meetings, announcements of
new books (other than Division of Mines publications): see under Book reviews
new topographic maps: see under Topographic maps
Anorthosite
recovery of alumina from: MIS 13-7
San Gabriel Mountains: B 170h-8
Antimony: PR 5; B 156-4; 176; MIS 1-5
deposits, California: R 12; 13
Stayton district, San Benito, Santa Clara, and Merced Counties: B 147
tariff rates on: MIS 4-1
Antioch quadrangle, geology of: B 149
Argon (Potassium—) method, determining age of rocks by: SR 54
Arrastres: MIS 12-10
Arrow mining district, San Bernardino County: R 6a
Arroyo Grande oil field: OM 19; B 118c
Arsenic: B 156-3; 176
from Grass Valley: R 33d
Arvin-Tehachapi earthquake: B 171; MIS 5-9
Asbestos: B 156-3; 176; MIS 4-6
Fresno County: MIS 12-8
Asphalt: B 156-3; 176
deposits, California: R 7; 10; 12; 13; 18e
genesis of California: B 16
see also: Bitumen
Assayers: See California, mineral producers, etc.
Atomic Energy Commission: MIS 4-5; 7-10; 8-3
Auburn field district, mines and mineral resources: R 17; 19
Austin, Bert C.: MIS 12-4
necrology: 13-10
Avawatz Mountains, economic minerals of: R 18c
Awards, mining: MIS 14-2

B

Baja California: B 170-c-3,d-3
Bardsdale oil field: OM 17; B 118c
Barite: MIS 4-11
Barstow area: SR 39
California: R 26a; B 156-3; 176
Barium: J 45a
Barstow area, geology: B 170r
Barstow quadrangle
geology: R 40a; B 165
Base-metal deposits, southern California: B 170i-5
Basement complex, Sacramento and San Joaquin Valleys: J 44b
Battery industry, mineral needs of: J 48a
Beach ridges: J 46b
Beach sands, mineralogy: SR 59
Beaches, geology: B 170f-4
Beet sugar industry, limestone in: J 47a
Belridge oil field: OM 10; AR 1-2; 10-1; B 118c
Belridge, North, oil field: OM 11; AR 1-10
Bentonite: R 37d; MIS 8-3
Otay deposit: SR 64
Berryessa Valley, geology and oil possibilities: B 118c
Beryl: R 27a; 36a

Beryllium: R 27a; 36a; B 156-3; 176; MIS 1-10; 5-12
Bethany quadrangle, Delta-Mendota Canal in: SR 2
Beverly Hills oil field: B 118c
BIBLIOGRAPHIES
clay in California: R 23b
coal in California: R 18d
copper in California: B 144
Cretaceous microfossils, California: SR 66
engineering geology, San Francisco Bay area: MIS 14-6
geology and mineral resources of California: R 35c; B 10; 30; 104; 115
gold mining, placer: R 28b
iron in California: B 129
lightweight aggregate: MIS 7-5
limestone deposits of California: R 18*l*
maps of Bay area: MIS 5-2
marine geology of California coast: SR 44
oceanography, California coast: SR 44
petroleum and natural gas in California: B 118c
Division of Mines publications on: MIS 7-1
rare earths: MIS 5-7
selenium: MIS 10-8
strategic minerals: MIS 3-10, 12
Big Bend quadrangle, geology and paleontology: SR 63
Big Bend zinc-copper mine, Butte County: B 144
Big Blue mines, geology: R 36d
Big Sur State Park, guide to geology: SR 11
Bimetalism: R 6a
Bishop tungsten district, geology: SR 47; MIS 10-9
Bismuth: B 156-4; 176; MIS 2-3
Bitterwater Creek area, Kern County, geology: SR 6
Bitumen, use by Indians in California: B 118a
see also: Asphalt
Bituminous base roofing industry, mineral needs: J 47c; MIS 4-1
Bitumnious rock (sand) deposits, California: R 12; 13; 18e; B 156-3; 176
Black granite, San Diego County: SR 3
Black Mountains, Death Valley: B 170e-7
Black sand: R 1; B 156-3; 176; MIS 4-8
auriferous: R 10; B 45; 135
Blind Spring Hill mining district, Mono County; R 36b
Blue Lake quadrangle, geology of: B 148
Blue Moon area, Mariposa County: B 144
Book reviews and announcements (including maps)
Suggestions to Authors: MIS 11-7
Geologic map indexes: MIS 3-3
Geologic Map Index of California: MIS 5-2
French Bibliographical Digest: MIS 8-2, 8
Geologic Names of North America Introduced 1936-1955: MIS 11-12
Glossary of Selected Geologic Terms: MIS 8-11
Rock Color Chart: MIS 2-4
General Principles of Geology: MIS 8-7
Principles of Geology: MIS 12-8
Entführung in die Gesteinswelt: MIS 11-5
Earth Science: MIS 9-3
Classification of Rocks: MIS 8-6
Stratigraphic Geology: MIS 9-2
General Crystallography: MIS 13-1
Evolution of Igneous Rocks: MIS 9-8
Interpreting Geologic Maps: MIS 7-10
Paleogeologic Maps: MIS 14-2
Lead-alpha Age Determination of Accessory Minerals of Igneous Rocks . . .: MIS 13-5
Geographic Essays: MIS 7-10
Eighteenth Geological Congress, Proceedings: MIS 5-8
Paleotectonic Maps, Jurassic System: MIS 10-2
U.S. Geological Survey publications: MIS 2-9; 14-1, 3, 5, 6

Volcanic Rocks of the El Modeno Area, Orange County, California: MIS 10-8
Geophysical Map of Los Angeles Basin: MIS 10-8
The Sea Off Southern California: MIS 14-2
Inshore Survey, San Francisco Bay: MIS 7-10
Pearland Quadrangle: MIS 7-2
Geology of the San Francisco North Quadrangle, California: MIS 12-1
Introduction to Microfossils: MIS 9-8
Foraminifera of the Lodo Formation: MIS 8-6
Foraminifera of the Monterey Shale and Puente Formation . . .: MIS 13-7
Upland Soils of Lake County: MIS 9-2
The Rock Hunter's Field Manual: MIS 12-5
Gem Materials Data Book: MIS 11-2
Gem Cutting: MIS 9-3
Rock Club Manual: MIS 9-8
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Almaden Mine: MIS 3-1; 4-1
Minerals of Boron, California: MIS 13-12
Minerals Yearbook: MIS 10-6
Mineral Resources of Colorado: MIS 1-7
U.S. Bureau of Mines Reports of Investigations: MIS 519
Utilization Studies on Chromite from Seiad Creek, California: MIS 13-12
Mineral Law: MIS 10-5
Survey of Mining Legislation . . .: MIS 11-8
National Minerals Policy: MIS 8-4
Let's Go Prospecting: MIS 8-3
Prospecting for Uranium: MIS 11-12
Uranium—Where It Is and How to Find It: MIS 8-3
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Airborne Anomaly Location Maps: MIS 8-3
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List of Basement Wells in California and Nevada: MIS 13-12
Geologic Features and Ground-water Storage Capacity of the Sacramento Valley, California: MIS 11-8
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Chemical Engineering: MIS 1-12
ASTM Standards: MIS 8-2
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Preliminary Bedrock-surface Map of the San Francisco City Area: MIS 8-1
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Landslide classification chart: MIS 14-4
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Biography of an Oil Man: MIS 8-2
The Life and Death of a Quicksilver Mine: MIS 12-4
Twenty Mule Team Days in Death Valley: MIS 9-2
Gold and Money: MIS 14-5
Gold vs. Grain: MIS 13-3

Metal Magic: MIS 2-7
Rocks to Riches: MIS 13-1
Birth and Development of the Geological Sciences: MIS 8-6
see also: CALIFORNIA STATE DIVISION OF MINES, announcements of publications
Borates: MIS 2-9
geology of Kramer district: R 42d
Borax: MIS 6-11
California deposits: R 3, pt 2; 12; 13
history of United States production: J 52c
Nevada deposits: R 3, pt 2
see also under Salines
Borax Lake: R 32a
Boron: B 176; MIS 10-10
Boron compounds: MIS 5-8
Boron steel: MIS 6-4
Boy Scouts of America: MIS 10-11
Bradley, Philip R.: MIS 10-8
Bradley-San Miguel district, geology and oil possibilities: R 118c
Brea Canyon oil field: OM 4
Breckenridge Mountain quadrangle, geology: B 168
Brick, adobe: MIS 12-7
Bristol Dry Lake, saline deposits of: SR 13; 32
Bromine: B 176
Browning, William C.: MIS 10-8
Buena Vista area, geology: SR 19
Buena Vista Hills area, Midway-Sunset oil field: OM 8; AR 8-2; 12-1; B 118c
Buhr millstone: R 1
Building (structural) materials, California: R 1; 6a; 7; 8; 12; 13; J 48b; B 38; 141; 154; SR 3
Carmel Valley: R 28a
see also: Dimension stone, Stone, Concrete, Cement
Building stone industry, San Francisco Bay region: B 154-5
Building structures to Sierran gold belt: B 141
Burruel Ridge area, geology: SR 21
BUTTE COUNTY: MIS 2-5
Big Bend zinc-copper mine: B 144
MINES AND MINERAL RESOURCES: RM 17; R 6b; 8; 10; 11; 15b; 17; 24c; 26d; J 45c
Poe Tunnel, geology: SR 61
Buttonwillow gas field: AR 7-3; B 118c

C

Cache Creek, sand and gravel resources: J 54b
Cachuma quicksilver district, Santa Barbara County: J 46d
Cadmium: B 156-4; 176; MIS 7-12
CALAVERAS COUNTY: MIS 2-6
ancient channel system: R 12
Angels Camp quadrangle, geology: SR 41
Calaveritas quadrangle, geology: SR 40
chromite: B 134 c2
Copperopolis area: B 144
geologic map of portion of Foothill copper belt: R 39d
gold mining on Carson Hill: B 141
MINES AND MINERAL RESOURCES: RM 1; R 6b; 8; 10; 11; 14a; 17; 21b; 32c
Penn zinc-copper mine: J 45a; B 144
Quail Hill copper area: B 144
quartz crystals from: R 40d
Sonora quadrangle, geology: SR 41
Calaveritas quadrangle, geology: SR 40
Calcite, optical: B 156-3; 176
Calcium chloride: B 176
Calera limestone, San Mateo and Santa Clara Counties: SR 1B
Calico Mountains, San Bernardino County, geology: R 36c
Caliente Range, geology and oil possibilities: R 35c; B 118c

CALIFORNIA
adsorbent clays in: J 49b
agricultural minerals: B 155
assayers: see below under mineral producers, etc.
auriferous black sands: B 45
bentonite in: MIS 8-3
bibliography of geology and mineral resources: R 35c; B 10; 30; 104; 115; MIS 13-3,5
black sands: B 45
building (structural) materials of: B 38
ceramic education in: MIS 5-8
chromite deposits of: R 1; 12; 13; 37a; B 76; 134; MIS 8-10
clay deposits of: PR 7; R 1; 9; 18j; B 99
clay in: MIS 5-7
clay survey planned: MIS 1-11
clays, adsorbent, in: J 49b
commercial minerals of: B 87; 124; 130; 156; MIS 1-1; 4-6
concrete aggregates: SR 27; 55
contributions to geology of: SP 2
copper deposits: R 12; 13; B 23; 50; 144
counties of: J 47b; B 142
Cretaceous microfossils, bibliography: SR 66
current mining activity: see Mining, current activity in
distances in: R 6b
earthquakes in: MIS 9-4
economic mineral resouces of: B 130; 156
economic minerals of, maps showing: B 118b; 156
evolution of landscape: B 158
faults in: MIS 9-4
fluorspar deposits of: J 47d
fossils of: R 7; B 4; 118b
gem minerals of: R 34a; B 37
geologic formations of: B 72
GEOLOGIC MAP OF: B 72; M 1; 17; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36
legend for: R 31b
Olaf P. Jenkins edition: M 28; 29; 30; 31; 32; 33; 34
source data: R 33a
geologic occurrence of mineral resources: B 156
geologic units of, glossary: B 118c
geology of: B 118b
geomorphic provinces of: B 118b; 156; 158
glass sand in: MIS 7-6
glaucophane schists: B 161; MIS 6-4
gold in: R 12; 13; 34a; B 135; MIS 6-5
gold placers of: B 92
gypsum: B 163
index to geologic maps in: SR 52
index to topograpic quadrangles of: R 41d
Indian mines and quarries in: R 40c
industrial materials of: B 38; 156
iron resources of: B 129
lakes of: R 29a; J 44b
landscape, evolution of: B 158
limestone deposits of: J 43c
magnesite deposits of: R 12; 13; B 79
manganese deposits of: R 12; 13; B 76; 125; 152; MIS 6-12
mineral commodities: J 48d; 50a; 156; 176
mineral industry
1896-99: B 20
1947: J 43d
1950-51: J 48a
mineral producers, dealers, laboratories: R 55; 56; MIS 5-3, 4; 7-9; 11-8 (also included in statistical bulletins; see under Statistics, California mineral production)

mineral production of: see Statistics, California mineral production
mineral raw materials: B 154-5
mineral resources of: R 8; B 156
minerals for tomorrow: R 42a
MINERALS OF: SP 12; 22; R 4; 6a; J 45d; B 67; 91; 113; 136; 173; MIS 10-3
minerals of, rare: R 2
mines and minerals of: B 35; 41; 44; 49
mining in: PR 6; 8
natural gas in: R 7; 12; 13; AR 11-9; B 3; 11; 19; 73; 82; 84; 118
nickel in: MIS 7-11
oil lands, control of: AR 6-4
oil supply: AR 6-1
origin of the name: R 6a
petroleum in: R 7; 12; 13; 34a; AR 6-7; B 3; 11; 19; 63; 69; 73; 82; 84; 89; 118; SR 23; 45; MIS 7-1; 11-3
placer mining for gold in: B 135
platinum deposits of: B 85
position in the industrial world: MIS 3-12
pozzolans in: MIS 7-9
progress in mineral industry, 1896-99: B 20
pumice and pumicite in: B 174; MIS 10-1
quicksilver deposits of: R 35d: B 27; 78
radioactive deposits in: SR 49
map showing: MIS 7-10
relief map of: M 3; R 27a; B 118b; 156; 158
relief model of: MIS 6-4
resources of: R 4; 5
saline deposits of: B 24
sand and gravel deposits: B 180
serpentine in: MIS 6-4
shaded relief map of: B 158
soda ash and saltcake in: J 44b
soils: B 155
status of geologic and topographic mapping in: R 40b
stratigraphic record: MIS 5-3
submarine phosphorite off coast of: J 46a
subsidence in: MIS 8-7
tin deposits of: R 37d
tungsten deposits of: R 37b,d
tabulation to accompany map: R 38c
volcanic cinders in: B 174; MIS 10-1
war-time mineral industry of: R 41a
California, northeastern, geology of: B 179; MIS 12-6
CALIFORNIA, NORTHERN
circular soil structures in: B 151
current mining activity in: R 30c
market for chemicals: J 46c
oil and gas in: B 118a
sand and gravel deposits: B 180A
CALIFORNIA, SOUTHERN
current mining activity: R 30c; 34a; 36a; 39b
geology of: B 170
strontium deposits: SR 32
California, southeastern, Pleistocene lakes in: MIS 14-4, 5
California, southwestern, crystalline rocks: B 159
California Historical Society, office moved: MIS 9-10
California Journal of Mines and Geology, discontinued: MIS 12-1
California State Department of Natural Resources Act: R 23d
CALIFORNIA STATE DIVISION OF MINES
announcements of publications
Report 56 of the State Mineralogist: MIS 13-8, 12
Journal, July 1943: MIS 4-8
Journal, July 1944: MIS 4-8
Journal, July 1947 MIS 1-4

Journal, October 1947 MIS 1-6
Journal, January 1948: MIS 1-6
Journal, April 1948: MIS 1-6
Journal, July 1948: MIS 1-9
Journal, October 1948: MIS 1-12
Journal, annual volume, 1948: MIS 2-3, 6
Journal, January 1949: MIS 2-3; 3-4
Journal, April 1949: MIS 2-6; 3-4
Journal, July 1949: MIS 2-8; 3-4
Journal, October 1949: MIS 2-12; 4-8, 9
Journal, January 1950: MIS 3-3, 4
Journal, April 1950; MIS 3-6
Journal, July 1950: MIS 3-9
Journal, October 1950: MIS 3-11
Journal, annual volume, 1950: MIS 4-11
Journal, April 1951: MIS 4-7
Journal, July 1951: MIS 4-7
Journal, October 1951: MIS 4-12
Journal, annual volume, 1951: MIS 5-3
Journal, January 1952: MIS 5-3
Journal, April 1952: MIS 5-5, 6
Journal, July 1952: MIS 5-8
Journal, October 1952: MIS 5-11
Journal, January-April 1953: MIS 6-6
Journal, July 1953: MIS 7-9
Journal, October 1953: MIS 7-1, 9
Journal, January 1954: MIS 7-4, 9
Journal, April 1954: MIS 7-5
Journal, July-October 1954: MIS 8-3, 8
Journal, annual volume, 1954: MIS 11-10
Journal, January 1955: MIS 8-4
Journal, April 1955: MIS 8-6
Journal, July 1955: MIS 8-8
Journal, October 1955: MIS 9-2
Journal, annual volume, 1955: MIS 11-10
Journal, January 1956: MIS 9-4
Journal, April 1956: MIS 9-7
Journal, October 1956: MIS 10-1
Journal, annual volume, 1956: MIS 11-10
Journal, January-April 1957: MIS 10-6, 8
Journal, annual volume, 1957: MIS 11-10
Journal, January 1958: MIS 11-5
Journal, April 1958: MIS 11-8
Journal, July 1958: MIS 11-9, 12
Journal, October 1958: MIS 12-2, 3
Bulletin 99: MIS 12-5
Bulletin 118: MIS 2-8; 4-9
Bulletin 123: MIS 2-8
Bulletin 125: MIS 3-8
Bulletin 129: MIS 1-9, 10; 3-8
Bulletin 130: MIS 3-4
Bulletin 134: MIS 1-8; 3-8; 4-5, 12; 5-6; 6-7
Bulletin 135: MIS 3-6
Bulletin 136: MIS 1-7; 4-8, 11; history, 7-12; supplement, 5-12
Bulletin 138: MIS 1-9
Bulletin 139: MIS 1-10
Bulletin 140: MIS 1-12; 2-1
Bulletin 141: MIS 2-1, 3; 5-12; 6-8, 11; 9-1; 13-5, 12; 14-4
Bulletin 142: MIS 2-8; 3-1, 4
Bulletin 144: MIS 2-6
Bulletin 146: MIS 13-4, 12
Bulletin 147: MIS 3-6
Bulletin 148: MIS 4-6
Bulletin 149: MIS 3-5; 4-6
Bulletin 150: MIS 4-4, 6

Bulletin 151: MIS 3-7
Bulletin 152: MIS 3-7, 8
Bulletin 153: MIS 4-6
Bulletin 154: MIS 5-1, 2; 8-4; 12-2, 3
Bulletin 155: MIS 4-7; 7-4
Bulletin 156: MIS 3-9, 10; 4-3, 7
Bulletin 158: MIS 4-9; 6-8; 11-1; 13-11, 12; 14-3
Bulletin 159: MIS 4-11
Bulletin 160: MIS 6-7
Bulletin 161: MIS 5-6
Bulletin 162: MIS 5-11
Bulletin 163: MIS 5-12; 7-4
Bulletin 164: MIS 7-2
Bulletin 165: MIS 8-1, 3
Bulletin 166: MIS 7-5
Bulletin 167: MIS 7-5
Bulletin 168: MIS 7-2
Bulletin 169: MIS 8-5, 6
Bulletin 170: MIS 8-9; 9-5; 13-11, 12; 14-1
Bulletin 171: MIS 9-4
Bulletin 172: MIS 8-10; 13-1, 12
Bulletin 173: MIS 10-2, 3, 9; 11-4; 12-4; supplement, 14-7
Bulletin 174: MIS 10-1
Bulletin 175: MIS 11-7
Bulletin 176: MIS 11-2; 13-5
Bulletin 177: MIS 12-12
Bulletin 179: MIS 14-2
Special Report 1A: MIS 4-1
Special Report 1B: MIS 4-2, 3
Special Report 2: MIS 3-12; 4-1
Special Report 3: MIS 4-2, 3
Special Report 4: MIS 4-2, 3
Special Report 5: MIS 4-4
Special Report 6: MIS 4-5
Special Report 7A: MIS 4-11
Special Report 7B: MIS 4-10
Special Report 8: MIS 4-10
Special Report 9: MIS 4-12
Special Report 10A: MIS 4-7, 9, 11, 12; 6-4
Special Report 10B: MIS 4-9; 6-4
Special Report 10C: MIS 4-9; 6-4
Special Report 11: MIS 4-10
Special Report 12: MIS 5-1
Special Report 13: MIS 4-12
Special Report 14: MIS 4-12
Special Report 15: MIS 5-3
Special Report 16: MIS 5-3
Special Report 17: MIS 5-4
Special Report 18: MIS 5-5
Special Report 19: MIS 5-7, 8
Special Report 20: MIS 5-11
Special Report 21: MIS 5-12
Special Report 22: MIS 5-12
Special Report 23: MIS 5-11; 9-1
Special Report 24: MIS 5-11, 12
Special Report 25: MIS 5-11
Special Report 26: MIS 5-12
Special Report 27: MIS 6-3
Special Report 28: MIS 6-2
Special Report 29: MIS 6-6
Special Report 30: MIS 6-6
Special Report 32: MIS 6-8
Special Report 33: MIS 6-12
Special Report 34: MIS 6-8
Special Report 35: MIS 7-3

Special Report 36; MIS 7-4
Special Report 37: MIS 6-11; 7-10
Special Report 38: MIS 7-12
Special Report 39: MIS 7-8
Special Report 40: MIS 8-8
Special Report 41: MIS 8-9
Special Report 42: MIS 8-4
Special Report 43: MIS 9-1
Special Report 44: MIS 9-1
Special Report 45: MIS 9-7
Special Report 46: MIS 9-10
Special Report 47: MIS 10-7, 9
Special Report 48: MIS 10-7, 9
Special Report 49: MIS 9-3
Special Report 50: MIS 12-3
Special Report 51: MIS 12-3
Special Report 52: MIS 11-8
Special Report 53: MIS 12-12
Special Report 54: MIS 11-10
Special Report 55: MIS 12-11
Special Report 56: MIS 12-11
Special Report 57: MIS 13-3, 12
Special Report 58: MIS 13-4, 12
Special Report 59: MIS 13-3, 12
Special Report 60: MIS 13-4, 12
Special Report 61: MIS 13-10, 12
Special Report 62: MIS 13-11, 12
Special Report 63: MIS 13-11, 12
Special Report 64: MIS 13-12
Geologic Map of California, 1938: MIS 9-8
Geologic Map of California, preliminary sheets: MIS 8-11
Geologic Map of California, automatic purchase plan: MIS 13-4
Geologic Map of California, Alturas sheet: MIS 12-4, 5
Geologic Map of California, Chico sheet: MIS 13-1
Geologic Map of California, Death Valley sheet: MIS 12-2, 3
Geologic Map of California, San Luis Obispo sheet: MIS 12-10
Geologic Map of California, Santa Cruz sheet: MIS 13-1
Geologic Map of California, Santa Maria sheet: MIS 13-4
Geologic Map of California, Ukiah sheet: MIS 13-12
Geologic Map of California, Westwood sheet: MIS 14-6
Bay area geologic road guides: MIS 14-1, 4
Shaded relief map California: MIS 14-3
De Argento Vivo: MIS 7-1
The Elephant As They Saw It: MIS 2-12; 3-4; 6-8
Fabricas: MIS 5-5, 6
Ione clay area guide: MIS 14-4
Legal Guide: MIS 3-4; 5-7, 11; 6-8; 8-1, 3; 13-6; 14-6
List of available publications: MIS 2-7; 10-12; 12-1
Publications on mining law: MIS 3-9
Ventura Basin guide: MIS 6-3
Alleghany-Downieville maps: MIS 13-2
Economic mineral map series: MIS 2-10
Quadrangle geologic map series: MIS 2-11
Topographic map index: MIS 2-7
annual report: See State Mineralogist, Annual Report of
careers in economic geology at the: SP 29
consolidated index of publications of: B 131
creation of: R 25c
exhibits at: MIS 2-7; 4-3, 9; 6-1, 5; 7-3, 8; 8-2, 7; 9-1; 11-4; 12-9; exhibit reopened, 7-4; cement plant model, 8-2
fire perils San Francisco offices: MIS 8-5
geological progress of: 37b
history of: MIS 3-3
Laboratory: MIS 4-3; 5-2; 9-2

Library:
accessions (books, etc.): MIS 1-3, 4, 5, 6, 8, 9, 10, 11, 12; 2-2, 4, 5, 7, 8, 10, 11, 12; 3-2, 3, 4, 5, 8, 10, 11, 12; 4-6; 5-4, 5, 6, 8, 10; 6-7, 11; 9-1
accessions (movies): MIS 2-12; 3-3, 4
moved: MIS 7-4
serials needed by: MIS 3-1
list of county reports published by: MIS 1-7
list of petroleum reports published by: MIS 7-1
Los Angeles office: MIS 12-9; 14-1
mineral identification by: MIS 1-8
Museum: see under California State Division of Mines, exhibits
open house: MIS 3-2, 3, 4
price lists of available publications: MIS 3-7; 4-7; 5-6, 10; 6-7; 7-8, 10-11; 11-12; 13-2
progress report: MIS 12-12
Public Resources Code: B 130; J 44d
publications of the: SP 20; 21; 23; 24; 25; J 44d; 45a,b,d; 47b
Redding office: MIS 2-1; 3-3, 6
research program: J 54d; MIS 12-10; 13-1
Sacramento office: MIS 3-9; 12-1; 13-8
staff: MIS 9-1, 4; 10-8; 11-2, 4, 9; 12-1, 10, 11; 14-5; see also under names of individual staff members
telephone: MIS 11-3
California State Division of Mines and Mining, creation of: R 23d
California State Mining Board: MIS 12-8
appointments to: MIS 12-4, 9
creation of: R 25c
organization: MIS 12-5
California State Mining Bureau
catalogues of the: SP 1; 3; 4; 5; 6; 7; 8; 9; R7; B4; 77
creation and history of: R 1; 6a; 12
index to publications of the: B 46
California State Mining Bureau Act, definition of "mine" and "mineral" for R 25c
California State Oil and Gas Supervisor, annual report of: AR 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; B 73; 82; 84
Calistoga silver mines, Napa County: R 6a
Camarillo oil field: OM 17
Caminetti Act: R 12; 34c; B 135
Campbell, Ian: MIS 12-1
Canal oil field: B 118c
Cantua-Vallecitos area, geology and oil possibilities: B 118c
Cape San Martin region, nephrite in: SR 10A
Capitan oil field: B 118c
Carbon: R 41c
Carbon dioxide: B 176; MIS 4-6
Imperial County: R 38b
Mendocino and northern Sonoma Counties: R 39c
Carbondale clays, Amador County, drilling by U. S. Bureau of Mines: J 45c
Cargo Muchacho Mountains, geology and mineral deposits: R 38b
Carmel Valley, building stone from: R 28a
phosphorite from: R 40d
Carpinteria district, geology: B 170r
Carquinez quadrangle, geology of: B 149
Carrizo Plain, geology and oil possibilities: R 35c; B 118c
Carson Hill, mining on: B 141
Casa Diablo Mountain quadrangle, economic geology: SR 48
Casmalia oil field: OM 3; AR 5-10; 8-6; B 118c
Cat Canyon oil field: OM 2; AR 7-9; B 118c
Catalina Island: see Santa Catalina Island
Cave Canyon iron-ore deposits, San Bernardino County: B 129e
Valley limestone: J 50c
Celestite, southern California: SR 32
Cement: R 8; 9; B 156-3; 176; MIS 8-2, 9; 9-11
Cement copper: MIS 5-4

Cement industry:
developments in: MIS 3-5; 5-5
San Francisco Bay region: B 154-5
Cenozoic
southern California: B 170d-4,5,6,7
Ceramic materials: B 165; MIS 2-4
See also: Clay
Ceramics: R 9; B 99; 169; MIS 8-11
California education in: MIS 5-8
kilns: MIS 6-10
production of glazed wall tile: MIS 6-6
San Francisco Bay area: B 154-5
Channel Islands, geology of: R 9
Chemicals, northern California market for: J 46c
Chert, Franciscan, in aggregate: SR 55
Chili Bar slate mine: MIS 7-10
Chino area, San Bernardino County, oil possibilities: B 118c
Chlorination: see Metallurgy and ore-dressing
Chlorine-caustic industry: MIS 3-4
Chrome purchase program: MIS 4-10

CHROMITE (CHROMIUM, CHROMIC IRON): PR 3; R 38a; B 156-4; 176; MIS 1-8; 2-11
costs of mining and concentrating: R 36b
DEPOSITS, CALIFORNIA: M 19; R 1; 12; 13; 37a; B 76; 134; MIS 8-10
El Dorado County: B 134c4
San Francisco Bay region, B 154-5
San Luis Obispo County: R 39a
Siskiyou County: R 39a; B 134a2
Tehama County: R 39a
specifications and prices for: R 37d
Cimo Dome: B 170f-8
Cinnabar, in San Mateo County: MIS 8-7
Circular soil structures: B 151
City area, Inyo County, geology: B 170r
Civil engineering, applications of geology to: R 29a
Clay: MIS 1-6; 8-6
adsorbent: J 49b; MIS 5-7
survey planned: MIS 1-11
see also: Bentonite

CLAY DEPOSITS
Alberhill: R 19d
CALIFORNIA: PR 7; R 1; 9; 18j; B 99; 156-3; 176; MIS 5-7
bibliography of: R 23b
Ione formation: SR 19
Ione-Carbondale, drilling by U. S. Bureau of Mines: J 45c
Mojave Desert playas: SR 69
Orange County: R 31a; MIS 6-10
Riverside County: R 31a
see also: Bentonite
Clay industry: J 52b; B 169; 176
California: J 49b
Los Angeles County: MIS 6-10
Research an aid to: MIS 5-7
San Francisco Bay area: B 154-5
see also: Ceramics
Clay research: MIS 5-7
Clerbus-Mae tungsten prospect, Trinity County: R 39b

COAL: B 156-2; 176; MIS 1-5
bibliography of: R 18d
DEPOSITS, CALIFORNIA: R 7; 9; 12; 13
see also: Mineral fuels
Coal-land law: R 7
Coalinga oil field: PR 1; OM 14; AR 1-2; 6-12; 7-8; 11-6; B 118c

COAST RANGES
chromite in: B 134b
genesis of manganese deposits of: B 125
COAST RANGES, CENTRAL, geology of: B 118b
COAST RANGES, NORTHERN, geology of: B 179; MIS 14-1
COAST RANGES, SOUTHERN, geology of: MIS 13-1
Cobalt: B 156-4; 176; MIS 1-9
history of the name: R 37c
Coining precious metals: R 9
Coke, in California: B 156-2
Colfax quadrangle: SR 67
Collins, E.: MIS 10-12
Colorado Desert, geology: SP 11; R 10
mud volcanos in: R 2
Colorado River, geology: B 170f-9
Columbium: MIS 6-4; see also Niobium
COLUSA COUNTY: MIS 2-7
geology: R 11
Cache Creek, sand and gravel resources: J 54b
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14b; 17; 25c
Commercial grinding plants, California, directory of: R 26c
Concentration of ores: see Metallurgy and ore-dressing
Concrete
aggregate for: J 52a; SR 55
Airox aggregate: R 40a
alkali-aggregate reaction: SR 27
decorative effects in: R 27a
tetrapods of: MIS 9-12; 10-1
Concretions
biconic: J 44c
from Piru (photos): MIS 13-1
ironstone: J 46b
Conejo oil field: B 118c
Confidence mining district, Tuolumne County, tungsten deposits: R 38c
Continental shelves, American: MIS 11-8
CONTRA COSTA COUNTY: MIS 2-8
Antioch quadrangle, geology of: B 149
Carquinez quadrangle, geology of: B 149
geologic guidebook: B 154
Mare Island quadrangle, geology of: B 149
MINES AND MINERAL RESOURCES: R 8; 10; 11; 17; 23a; J 47d; 54d
Convict Basin, Mono County, geology of: R 30a
Cool—Cave Valley limestone: J 50c
COPPER: R 22c; B 156-4; 176; MIS 1-2; 5-5
DEPOSITS
Afterthought mine: SR 29
CALIFORNIA: R 12; 13; B 23; 50; 144
Foothill, map showing: R 39d
Iron Mountain sulfides: SR 14
Island Mountain mine: J 53a
Mammoth mine: SR 28
Mountain Copper Company: J 43b
Penn mine: J 45a
Shasta County: R 20d
Shasta district, West: MIS 10-8
Shasta King mine: SR 16
with uranium: MIS 8-3
Copperopolis area, ore deposits: B 144
quadrangle, geology: B 145
Corona area, geology: B 170r
Corona quadrangle: B 159
Corona South quadrangle, geology, mines, mineral deposits: B 170
Coso Mountains (Range), hot-springs deposits of: R 38c
quicksilver deposits of: R 26a
Counties of California, the: B 142

County reports on mines and mineral resources: see under each county
Coyote Hills oil field: OM 4; 5; AR 4-2; B 118c
Crestmore
  metamorphism: B 170h-7
  minerals of: R 39c
Cretaceous formations, Santa Ana Mountains: B 118c
Cretaceous microfossils: SR 66
Crystalline rocks, southwestern California: B 159
Cuyamaca Peak quadrangle: B 159
Cuyama Valley, geology: R 35c; B 118c; 170r
Cyanide process: see Metallurgy and ore-dressing
Cyanite deposits, California: R 27c
Cymric area, McKittrick oil field, B 118c

D

Darwin mining district, Inyo County: R 34d
Darwin quadrangle, economic geology: SR 51
De argento vivo: J 49c
Death Valley
  celestite deposits: SR 32
  geology: B 170c-10; MIS 11-10
  turtlebacks: B 170e-7
Death Valley, geologic guide: B 170*l*
Debris Commission Act, California: R 12
Defense Minerals Administration: MIS 4-3, 5, 6, 11
Defense Minerals Exploration Administration: MIS 6-7; 7-5; 10-12
DEL NORTE COUNTY: MIS 2-9
  chromite: B 134 a1
  geology, economic: R 29a
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 14c; 17; 21c; 29a; J 48d
Del Valle oil field: B 118c
Delta-Mendota Canal, geology of: SR 2
Desert processes: B 170f-2
Desiccated human remains, in California State Mining Bureau: B 1
Devils Den oil field: OM 12; AR 9-12; B 118c
Diamonds: R 2
Diatomaceous earth: R 2; J 54c
Diatomite: B 156-3; 176; MIS 6-11
  Lompoc deposits: R 32b
  Poverty Hills, Inyo County: J 54c
  San Francisco Bay region: B 154-5
Diatoms, general characteristics of marine and fresh water: R 18b
  Kreyenhagen shale: R 27b
Dietrich, W. F.: MIS 12-5
Dimension stone: MIS 9-6; 10-7
  granitoid, San Diego County: SR 3
  see also: Building stone, Structural materials
Directory, commercial grinding plants in California: R 26c; B 139
  custom mills in California: B 139
  foundries in California: R 21d
  mineral brokers: B 139
  mineral producers in California: R 55; 56; 57; B 105; 107; 109; 110; 111; 112; 114; 116; 117; 119; 121; 122; 126; 128; 130; 132; 137; 139
  oil companies and operators: AR 1-6; 2-6; 3-8; 7-2; 10-2; 11-2; 12-2; 13-2; 14-2
  quicksilver buyers: B 139
  smelters purchasing California metals: B 139
  testing laboratories and assayers: B 139
DMA: see Defense Minerals Administration
DMEA: see Defense Minerals Exploration Administration
Dolomite: B 156-3; 176; MIS 12-2
  Gabilan Range, northern: SR 56
  industrial uses of: J 45b
  Standard quadrangle, south half: SR 58
Dominquez oil field: OM 29; AR 10-7; 12-4; B 118c; 170r
Downieville area, Sierra County, gold lode mines in: J 52c; MIS 8-2

Draft, effect on mining: MIS 3-12
Dry Canyon quadrangle, geology: R 34b
Dudley Ridge gas field: B 118c
Duxbury Point region, geology and oil possibilities: B 118c

E

Eagle Bird mine, Nevada County, lawsuit: R 10
Eagle Mountains iron-ore deposits, Riverside County: B 129a
EARTHQUAKES
  doing something about: R 34a
  in California: MIS 9-4
  Kern County, 1952: B 171; MIS 5-9
  Mission-period, 1769-1838: R 37b
  Owens Valley, 1872: R 8
  San Francisco, 1957: SR 57; MIS 10-5
  San Francisco Bay area: B 154-3
  southern California: B 170e-3, k
  West Yellowstone: MIS 12-10
  Wilmington, 1955: MIS 8-7
  See also: Geology, structural
East Fork mining district, Trinity County, gold lodes: R 18f
Economics, mineral: see Mineral economics
Edison oil field: B 118c
Edna (Arroyo Grande) oil field: B 118c
Eel River valley, geology: B 164
EL DORADO COUNTY: MIS 2-10
  Chili Bar slate mine: MIS 7-10
  chromite deposits: B 134c4
  Cool—Cave Valley limestone: J 50c
  geology: R 12
  Lilyama and Pioneer copper mines: B 144
  MINES AND MINERAL RESOURCES: RM 6; R 6b; 8; 10; 11; 15c; 17; 22d; 34c; J 52d
El Segundo oil field: B 118c
Electra tunnel, Amador County, geology: J 46a
Electric-power plants, California: R 13
Electricity, use in mining: R 12
Electrum, occurrence in California: R 1
Elephant as they saw it: J 45d
Elizabeth Lake quadrangle, geology and mineral resources: R 30c
Elk Hills oil field: OM 15; AR 4-3; 7-1; 10-11; 12-10; B 118c
Elsinore area, geology: B 170r
Elsinore fault zone, geology: SR 43
Elsinore quadrangle: B159
Elwood oil field: B 118c
Employment
  in mineral extraction industry: MIS 6-1
  recommendations of Governor's Conference on: MIS 3-2
Eocene formations, foraminiferal correlation of: B 118b
Exhibits, announcements of (see also Meetings)
  California Federation of Mineralogical Societies: MIS 4-6; 5-6
  Exposition Park, Los Angeles: MIS 4-3
  Oakland Mineral and Gem Show: MIS 4-8
  San Diego County Fair gem and mineral exhibit: MIS 1-8
  Pacific Chemical Exposition: MIS 2-10
  San Francisco Gem and Mineral Society: MIS 6-9
Exploration costs of small mines: MIS 13-12

F

Fabricas: J 48b
Fairfield Knolls gas field: B 118c
Fairview chromite deposit, Siskiyou County: R 39a
Farallon Islands, geology: B 154-7
Faulting: see Geology, structural

Fauna, Recent, Mollusca of Channel Islands: R 9
west North American shells: SP 8
see also: Fossils
Feldspar: B 156-3; 176; MIS 2-1
deposits, California: R 27c
tariff rate change on: R 28a
Ferndale quadrangle, geology: B 164
Ferro-alloys: B 156-4; MIS 2-10
Fertilizers, mineral: B 155; MIS 1-12; 2-7
Fire, danger of: MIS 12-9
Flora, Recent, Channel Islands: R 9
forest trees of California: R 2
Fluorescence: MIS 4-7
of minerals: MIS 7-3
Fluorescent minerals, used in lighting: R 40c
Fluorite: MIS 3-5
Fluorspar: R 41c; J 47d; B 156-3; 176
Foothill copper-zinc belt: B 144
Foraminifera
bibliography: SR 66
California: B 118b
Los Angeles region: B 170d-5
Ventura region: B 170d-5
Forest products used in California mines: MIS 6-3
Forest Hill Divide, geology of: R 10
Foresthill quadrangle: SR 67
Fortuna quadrangle, geology: B 164
Fossils, catalogue of California: R 7; B 4
characteristic of California: B 118b
collecting and interpreting: MIS 13-7
forminifera, southern California: B 170d-5
land animals, Cenozoic: B 170d-6
markers, Midway-Sunset field: AR 12-10
use in geologic exploration: MIS 5-6
value as mineral indicators: R 9
see also: Paleobotany, Paleontology, Fauna, Flora
Foundries, California, directory of: R 21d
Foundry sands, California: R 21b; J 44a
Franciscan chert, in aggregate: SR 55
FRESNO COUNTY
chromite deposits of eastern: B 134c3
geology Twin Lakes region: R 38c
Huntington Lake area, geology: SR 46
MINES AND MINERAL RESOURCES: R 6b; 8; 10; 11; 14d; 17; 25c; J 47c
Moreno formation in: SR 9
New Idria district quicksilver deposits: R 39a; 42b
Oil City oil fields, map of: B 15
oil fields: AR 2-5; 3-7
Ortigalita Peak quadrangle: B 167
tungsten deposits: SR 35
FRESNO COUNTY, NORTHWESTERN, quicksilver deposits of: R 41a
Fruitvale oil field: B 118c
Fullerton oil field: OM 4; 5

G

Gabilan Range, limestone and dolomite in northern: SR 56
Galena, deposits of argentiferous: R 12; 13
Gallium: MIS 2-8
Gas, carbon-dioxide: see Carbon-dioxide gas
Gas, natural: See Natural gas
Gasoline, extraction from natural gas by absorption: AR 1-6
Gato Ridge area, Cat Canyon oil field: B 118c
Gaviota-Concepcion area, oil possibilities: B 118c
Gaviota quadrangle, geology of: B 150
Gazelle region, Siskiyou County, limestone in: J 45d
Geiger counters: MIS 8-2

Gem minerals, California: R 34a; B 37; 156-3; 176; MIS 3-4; 11-6
Himalaya mine: MIS 11-8
Pala pegmatites: SR 7A
Gems, lithium: MIS 6-9
General Services Administration: MIS 4-9, 10; 5-9, 12; 7-10; 9-4; 10-7
Geneva Steel Co.: MIS 4-11
Geochemical prospecting: MIS 6-3
Geologic exploration, use of fossils in: MIS 5-6
GEOLOGIC GUIDE SERIES
Death Valley: B 170*l*
Highway 49: B 141
Ione clay area: SP 28
Los Angeles Basin: B 170n,p
Mojave Desert: B 170*l*
Mother Lode country: B 141
Peninsular Ranges: B 170q
Pfeiffer Big Sur State Park: SR 11
San Francisco Bay area: MIS 2-2
air trip: MIS 2-2
San Francisco Bay counties: B 154
Ventura Basin: B 170m; MIS 6-2
Geologic investigation, history of: B 154-3
Geologic map coverage, San Francisco Bay area: MIS 5-2
Geologic mapping
application of aerial photography to: AR 5-9
status in California: R 40b; MIS 11-2
Death Valley sheet: MIS 11-10
Geologic maps, interpretation of: MSI 13-8
Geologic maps: see MAPS, geologic
Geologic units of California, glossary of: B 118c
Geological surveys, State: J 45b
GEOLOGY, application to civil engineering: R 29a
placer deposits: 31b
GEOLOGY, COUNTY: see under name of county
GEOLOGY, ECONOMIC
Afterthought mine: SR 29
Barite deposits, Barstow area: SR 39
Big Blue mines, Kernville: R 36d
Bishop tungsten district: SR 47
Blind Spring Hill mining district, Mono County: R 36b
Breckenridge Mountain quadrangle, Kern County: B 168
Bristol Dry Lake, salines: SR 13
Cache Creek, sand and gravel resources: J 54b
Cargo Muchacho Mountains: R 38b
careers in: SP 29
Casa Diablo Mountain quadrangle: SR 48
ceramic products, Ione formation: SR 19
clay minerals, Mojave Desert: SR 69
Corona South quadrangle: B 178
Darwin quadrangle: SR 51
dimension stone, granitoid, San Diego County: SR 3
Gabilan Range, northern, limestone and dolomite in: SR 56
grain size, fragmental sedimentary rocks: MIS 13-9
Iron Mountain sulfides: SR 14
Island Mountain copper mine, Trinity County: J 53a
Kern River sand and gravel: SR 70
Mammoth mine: SR 28
Miocene formations, Kern County oil fields: AR 14-1
Mojave Desert, clay in playas: SR 69
New Almaden mine: SR 17
Otay bentonite deposit: SR 64
Pala pegmatites: SR 7A
Palen Mountains gypsum deposit: SR 36
Pine Creek mine, Inyo County: SR 47
Poverty Hills diatomaceous earth deposit: J 54c

Rincon pegmatites: SR 7B
Saline Valley area, Inyo County: MIS 8-8
San Bernardino Mountains: SR 65
Santa Rosa lead mine: SR 34
Shasta King mine: SR 16
Silver Lake talc deposits: SR 38
southern California, oil fields: B 170r
Standard quadrangle, limestone and dolomite: SR 58
Starbright tungsten mine: J 48c
steatite talc: SR 8
strontium deposits, southern California: SR 32
Superior talc area: SR 20
tungsten deposits, Madera, Fresno, Tulare Counties: SR 35
Uehebe Peak area: SR 42
Ventura School for Girls, oil at: SP 31
West Shasta copper-zinc district: MIS 10-8
see also under Geology, regional; Maps; and under names of individual minerals and rocks

GEOLOGY, ENGINEERING
bibliography, San Francisco Bay area: MIS 14-6
clay: B 169
Delta-Mendota Canal: SR 2
Electra and West Point tunnels, Amador County: J 46a
Mono Craters tunnel: R 36b
Poe Tunnel: SR 61
see also under Earthquakes, Landslides, Subsidence

Geology, marine, bibliography of California: SR 44

GEOLOGY, HISTORICAL
southern California: B 170d
see also: Paleobotany
Paleontology

Geology, offshore: MIS 12-5

GEOLOGY, MINERAL DEPOSITS: see under name of mineral

GEOLOGY, PHYSIOGRAPHIC, ancient surface in Sierra Nevada: R 30a
circular soil structures: B 151
evolution of California landscape: B 158
glaciation of Sierra Nevada: R 28c
landslides of Lone Mountain: R 32d
Pleistocene lakes, southeastern California: MIS 14-4, 5
San Francisco Bay counties: B 154-2
southern California: B 170c,f

GEOLOGY, REGIONAL
Alameda County: MIS 2-1
Alexander Hills: B 170r
Angels Camp quadrangle: SR 41
Antioch quadrangle: B 149
Baja California: B 170c-3
Barstow quadrangle: R 40a; B 165; 170r
Berryessa Valley: B 118c
Big Bend quadrangle, southwest quarter: SR 63
Big Pine quadrangle: SR 47
Big Sur State Park: SR 11
Bishop quadrangle: SR 47
Bitterwater Creek area, Kern County: SR 6
Blue Lake quadrangle: B 148
Bradley—San Miguel district: B 118c
Breckenridge Mountain quadrangle: B 168
Buena Vista area: SR 19
Burruel Ridge area: SR 21
Calaveritas quadrangle: SR 40
Calico Mountains: R 36c
Caliente Range, Cuyama Valley, Carrizo Plain: R 35c; B 118c
California
northeastern: MIS 12-6

southern: B 170
offshore area: B 170 c-7; MIS 12-5
Cantua-Vallecitos area: B 118c
Carquinez quadrangle: B 149
Casa Diablo Mountain quadrangle: SR 48
City area, Inyo County: B 170r
Coast Ranges: B 125
central: B 118b
northern: B 179; MIS 14-1
southern: MIS 13-1
Colorado Desert: SP 11; R 10
Copperopolis quadrangle: B 145
Corona-Elsinore-Murrietta area: B 170r
Corona quadrangle: B 159
Coso Mountains: R 38c
Cuyama Valley area: B 170r
Cuyamaca Peak quadrangle: B 159
Death Valley: B 170c-10,*l*
Duxbury Point: B 118c
Eel River valley: B 164
Elizabeth Lake quadrangle: R 30c
Elsinore quadrangle: B 159
Farallon Islands: B 154-7
Ferndale quadrangle: B 164
Foothill copper belt: R 39d
Forest Hill Divide: R 10
Fortuna quadrangle: B 164
Gaviota quadrangle: B 150
Griffith Park area, Los Angeles County: SR 33
Halfmoon Bay district: B 118c
Healdsburg quadrangle: B 161
Highway 40: MIS 12-8
Hollister quadrangle: B 143
Huasna area: B 118c
Humboldt County, central and southern: B 118c
Huntington Lake area: SR 46
Jacumba area: B 170r
Jamesburg quadrangle: R 40b
Johnston Grade area, San Bernardino County: SR 31
Joshua Tree National Monument: B 170r; SR 68
Julian-Cuyamaca area: R 42a
Jurupa Mountains: SR 5
Imperial Valley: B 170c-2
Kernville quadrangle: R 36d
Lake Elsinore quadrangle: B 146
Las Trampas Ridge: SR 22
Last Chance Canyon area: B 170r
Lebec quadrangle: SR 24
Little Tujunga area, Los Angeles County: B 170r
Lompoc quadrangle: B 150
Los Angeles basin: B 170c-5, n, p
Los Olivos quadrangle: B 150
Lower Lake quadrangle: B 166
Macdoel quadrangle: B 151
Mare Island quadrangle: B 149
Mojave Desert: B 170c-1; h-2, *l*
Mono County, southwestern: R 26d, 30a
Mother Lode: R 10; 13; 28c; B 18; 108; 141
Mount Diablo: B 118c
Mount Tom quadrangle: SR 47
Mount Vaca quadrangle: B 149
Mud Hills, strontianite deposits: SR 32
Needles-Goffs: R 40a
Neenach quadrangle: B 153

Newberry and Ord Mountains: R 36c
Oceanside-San Diego area: B 170c-4
Orchard Peak area: SR 62
Ortigalita Peak quadrangle: B 167
Owens Valley region: B 170r
Palm Springs-Blythe strip: R 40a
Panamint Range: R 28c
    northern: SR 25
Paskenta region: B 118c
Peninsular Ranges: B 170c-3, q
    southern: R 31b
Perris block: R 31d
Petaluma district: B 118c
Petaluma quadrangle: B 149
Pfeiffer Big Sur State Park: SR 11
Point Arena-Fort Ross region: B 118c
Point Arguello quadrangle: B 150
Point Conception quadrangle: B 150
Point Reyes quadrangle: B 149
Quail quadrangle, southern: SR 30
    Mountains: B 170r
Quartz Spring area: SR 25
Quien Sabe quadrangle: B 147
Randsburg quadrangle: B 95
Redding-Weaverville district: R 29a
Redrock Canyon area: B 170r
Ridge Basin: SR 26; B 170r
Rosamond Hills: B 170r
Rumsey Hills area: B 118c
Saltdale quadrangle: B 160
San Benito quadrangle: R 39b
San Bernardino Mountains: SR 65
San Diego County, southwestern: R 35a; B 170c-4
San Fernando quadrangle: B 172
San Francisco Bay: B 154-2
    area north of: B 149
San Francisco Bay counties: B 154-3
San Gabriel Mountains, western: R 33c; B 170r
San Gorgonio Pass: B 170r
San Jacinto quadrangle: R 27d
San Joaquin Valley: B 170c-8
San Jose Hills, western: J 46b
San Jose-Mount Hamilton area: B 157
San Juan Bautista quadrangle: B 133
San Luis Rey quadrangle: B 159
Santa Barbara County, southwestern, geology of: B 150
Santa Cruz Island: R 9; 27b
Santa Maria river: R 10
Santa Monica Mountains: R 34b; B 170r
Santa Rosa Mountain area: R 42a
Santa Rosa quadrangle: B 149
Santa Ysabel quadrangle: B 177
Scotia quadrangle: B 164
Sebastopol quadrangle: B 162
Sequoia-Kings Canyon National Parks: SR 53
Sespe Creek-Pine Mountain area, Ventura County: B 170r
Shasta quadrangle: R 27a
Shadow Mountains: B 170r
Sierra Nevada: B 125; 141
    northeast of Visalia, Tulare County: R 39b
Sierra Nevada, northern: R 28c
Silurian Hills: B 170r
Sites region: B 118c
Soledad basin, Los Angeles County: B 170r

Soledad quadrangle: B 118c
Sonoma quadrangle: B 149
Sonora quadrangle: SR 41
southern California: B 170
southwestern California: B 159
Tehachapi Mountains: B 170c-9
Tesla quadrangle: B 140
Transverse Ranges: B 170c-6
Tujunga quadrangle: B 172
Tunis-Pastoria Creek area, Kern County: B 170r
Twin Lakes area, Fresno County: R 38c
Vacaville quadrangle: B 149
Ventura Basin: B 170m, r; MIS 6-2
Whittier-La Habra area: SR 18

GEOLOGY, STRATIGRAPHIC
basement complex, Sacramento and San Joaquin Valleys: J 44b
California: B 118b; MIS 5-3
Cretaceous formations, Santa Ana Mountains: B 118c
Ione formation: SR 19
Knoxville-Shasta succession: R 28c
Mesozoic in California: B 118b
Miocene formations, Kern County oil fields: AR 14-1
Moreno formation: SR 9
Paleozoic section, Nopah-Resting Springs region: R 33d
Rincon Hill well, San Francisco: R 10
southern California: B 170d
Tertiary formations, northern Sacramento Valley: R 35c
Tertiary in California: B 118b

GEOLOGY, STRUCTURAL
Elsinore fault zone: SR 43
faults, in California: MIS 9-4
southern California: B 170e,f-3
see also: Earthquakes, Subsidence

Geochemical prospecting, for petroleum: B 118a
Geomagnetic methods of tracing buried river channels: R 29a
Geomorphic provinces of California: B 118b
Geophysical prospecting: MIS 5-11
Geophysical studies in California: B 118a
Georgia, gold mines of: R 5
Geothermal power: MIS 13-3
Germanium: MIS 5-11
Geysers, The, minerals at: R 42c
radioactivity in gases: R 18j
Ghost Canyon tungsten claims, Madera County: R 38c
Gibson area, Midway-Sunset oil field: B 118c
Glacial stream deposits, Sierra Nevada: R 28c
Glaciation, Pleistocene: B 170f-6
Glass, manufacture in California: R 9
Glass container industry, mineral needs of: MIS 2-9
Glass industry, minerals in: MIS 5-10
Glass sand: MIS 7-6; 8-11
Glaucophane schists
in California: MIS 6-4
mineralogy: B 161
use for: MIS 6-4

GLENN COUNTY, MINES AND MINERAL RESOURCES: R 11; 14b; 17; 25d; J 48a

GOLD: R 2; 5; B 156-4; 176
changing mercury to: MIS 10-12
discovery in California: J 45d; B 141
in California: R 34a; MIS 6-5
price of: R 37c
prospecting for: R 28b; 29a; 33a
skin diving for: MIS 13-6

statistics, number of men mining: R 9
uses, refining and coining: R 9
GEOLOGY OF LODE, Mother Lode region: R 10; 13
quartz veins, formation of: B 141
wall rocks of veins: R 8
GEOLOGY OF PLACER: R 9; 12; 28c; B 92; 135
channels of Duncan Canyon region, Placer County: R 21c
channels of Forest Hill Divide: R 10
Mojave Desert: R 30c
new technique applicable to study of: R 31b
primary and secondary concentrations: R 19a
Tertiary sluice robbers: R 18j
GOLD DEPOSITS
black sands: R 10; B 45; 135
CALIFORNIA: R 12; 13; B 135
East Fork mining district, Trinity County: R 18f
Kern County: R 29b
Meadow Lake district, Nevada County: R 32b
Mojave Desert: B 170i-6
Mother Lode: B 108
Placer County: R 32a
Redding-Weaverville district: R 29a
southern California: R 28b
see also: particular localities—counties, states, districts, etc.
GOLD MINING
Carson Hill, Calaveras County: B 141
east-central California: R 31a
history of California: J 45d; B 141
LODE: R 9; 10
Alleghany-Downieville area, Sierra County: R 18j; J 52c; MIS 8-2
Kennedy mine, tailing wheels: MIS 11-7
on Carson Hill: B 141
sampling deposits: R 30a
PLACER: R 2; 9; 30b; B 135
beach: R 10
bibliography on: R 28b
booming: R 29b
dams for debris control: R 31c
dragline dredging, Siskiyou County: R 37b
dredging: R 34b; B 36; 57
drift: R 2; 8; 9
dry-: R 18g
equipment for small-scale: MIS 6-8
history of California: B 141
hydraulic: R 2; 23a
hydraulic ejectors: R 11
machines for: R 25a; 28b
methods: MIS 10-8
power shovels: R 32c
river: R 9
San Francisco district: R 31a
water rights and: MIS 12-5
GOLD ORES, costs of trucking and packing in western districts: R 35c
TREATMENT OF, Belmont-Shawmut mine, Tuolumne County: R 18*l*
chlorination: R 6b
concentration: R 6b
cyanidation: R 10; 27b; 34c; B 5
flour gold: R 2
hydrometallurgy: R 8
milling: R 2; 6; 9; 30b; B 6
tests for determining quality; R 5; 6b; 12
Golden Gate, opening of the: B 154-1
Goler mining district, Kern County: R 12
Goleta oil field: B 118c
Goose Lake meteorite: R 35c

Gorman district, Kern County, tin deposits of the: R 42a
Grain size of sedimentary rocks: MIS 13-9
Granite Rock Co. quarry and plant, San Benito County, operations: B 133
Granitic rocks, age determination: SR 54
Granitoid dimension stone, San Diego County: SR 3
Graphite: PR 5; B 156-3; 176
Gravel: J 52a; 54b; B 156-3; 176; 180; SR 70; MIS 8-12; 9-5; 11-6
Grayhouse copper area, Amador County: B 144
Greeley oil field: B 118c
Griffith Park area, Los Angeles County, geology: SR 33
Grinding plants, commercial, directory of: R 26c
Ground-water, Santa Maria river: R 10
GSA: see General Services Administration
Guadalupe quicksilver mine: MIS 10-4; 12-4
Guano: MIS 13-4, 7
Guerneville district, quicksilver deposits: J 44c
Guidebooks: See Geologic guidebook series
Gypsum: MIS 1-1; 9-6
  agricultural: B 155
  California: R 12; 13; 18e; B 163; 176; MIS 2-5
  Clark Mountain deposit: MIS 5-6

H

Hafnium: B 176
Halfmoon Bay, mineralogy of beach sands: SR 59
Halfmoon Bay district, geology and oil possibilities: B 118c
Hallock, George W., necrology: MIS 8-7, 8
Hambergite: MIS 10-9
Hamilton, Fletcher M., necrology: MIS 12-1
Hanksite: R 5
Hannum, General Warren T., necrology: MIS 9-10
Health and safety work, U. S. Bureau of Mines: J 46c
Highway 40, geology along: MIS 12-8
Highway 49
  current mining activity along: MIS 9-1
  geologic guidebook along: B 141
Highways, California mineral products used in: MIS 9-10
Hirz Mountain iron-ore deposits, Shasta County: B 129j
Hollister quadrangle, geology of: B 143
Honor Rancho oil field: B 170r
Hovey Hills oil field: AR 9-12
Huasna area, geology: B 118c
Human remains, desiccated, in California State Mining Bureau: B 1
HUMBOLDT COUNTY
  Blue Lake quadrangle, geology: B 148
  central and southern, geology and oil possibilities: B 118c
  Eel River valley, geology: B 164
  Ferndale quadrangle, geology: B 164
  Fortuna quadrangle, geology: B 164
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 14c; 17; 21c; 37d
Huntington Beach oil field: OM 26; AR 7-5; 9-6, 9; 12-12; 13-11, 12; B 118c
Huntington Lake area, Fresno County, geology: SR 46
Hydraulic filling in metal mines: SR 12; MIS 3-1
Hydraulic mining: see Gold mining, placer
Hydraulic Mining Commission, report on resumption of hydraulic mining: R 23a
Hydrology, southern California: B 170g
Hydromagnesite, analysis of: R 6b

I

Idaho-Maryland mine, occurrence of scheelite in: R 37b
Imperial carbon-dioxide gas field, Imperial County: R 38b
IMPERIAL COUNTY: B 170
  MINES AND MINERAL RESOURCES: R 14e; 17; 20b; 22b; 38b
  depression: B 170f-9

Imperial Valley
exploration for petroleum in: AR 5-10
geology: B 170c-2
Index to geologic maps of California: SR 52
Indians
mines and quarries of California: R 40c
salt in culture of California: B 175
San Francisco Bay area: B 154-1
southern California: B 170b-3
use of bitumen by California: B 118a
Inglewood oil field: OM 31; AR 11-12; B 118c
INYO COUNTY
Darwin quadrangle, economic geology: SR 51
geology: M 14; R 8; B 170
Millspaugh iron deposite: R 42d
MINES AND MINERAL RESOURCES: RM 7; R 8; 10; 12; 15a; 17; 20c; 22d; 34d; J 47a
petroleum in: AR 3-6
Pine Creek and Adamson tungsten mines: R 41d; MIS 3-2
Poverty Hills diatomaceous earth deposit: J 54c
Quartz Spring area, geology: SR 25
quicksilver deposits in Coso Range: R 26a
Resting Springs region, geology and mineral resources: R 33d
Saline Valley area: MIS 8-8
Santa Rosa lead mine: SR 34
talc deposits, steatite: SR 8
Tungsten Hills, geology and tungsten deposits of: J 46a
Uehebe Peak area, geology of mineral deposits: SR 42
see also: Death Valley
Iodine: B 176; MIS 2-9
Ione clay area, field trip to: SP 28
Ione formation: SR 19; MIS 9-8
Ione-Carbondale clays, Amador County, drilling by U. S. Bureau of Mines: J 45c
IRON: B 156-4; 176; MIS 1-2
DEPOSITS, CALIFORNIA: R 1; 2; 12; 13; 18c; B 129
southern California: B 170i-5
Millspaugh and Tiefort Mountains: R 42d
Iron Hat iron-ore deposits, San Bernardino County: B 129g
Iron King iron-ore deposit, San Bernardino County: B 129c
Iron Mountain iron-ore deposits, Madera County: B 129i
San Bernardino County, Lava Bed district: B 129b
Silver Lake district: B 129c
Iron Mountain sulfide deposits, Shasta County: SR 14
Ironclad iron-ore deposits, San Bernardino County: B 129g
Island Mountain copper mine, Trinity County, geology: J 53a
Isometrograph, development and use at New Idria mine: R 39c

J

Jackson, Tertiary volcanic domes near: SR 60
Jacumba area, geology: B 170r
Jade: MIS 4-8
jadeite: SR 10C; MIS 3-4
nephrite: SR 10A, B
Jamesburg quadrangle, geology: R 40b
Jenkins, Hubert O., necrology: MIS 12-6
Jenkins, Olaf P.
edition of geologic map of California: M 28; 29; 30; 31; 32; 33; 34; 35; 36
retirement: MIS 11-2, 4
Jesse Belle copper mine, Madera County: B 144
Johnston Grade area, San Bernardino County, geology of: SR 31
Joshua Tree National Monument, geology: B 170r; SR 68
Julian district, San Diego County: R 30c
Julian-Cuyamaca area, San Diego County: R 42a
Jurupa Mountains, geology: SR 5

K

Kennedy gold mine, Amador County: MIS 11-7
KERN COUNTY: B 170
  Bitterwater Creek area: SR 6
  Breckenridge Mountain quadrangle: B 168
  earthquakes, 1952: B 171
  geology: R 8
  gold resources: R 29b
  Gorman district, tin deposits of: R 42a
  Kern River sand and gravel: SR 70
  Kramer borate district: R 42d
  Lebec quadrangle, geology: SR 24
  MINES AND MINERAL RESOURCES: RM 18; 8; 10; 11; 14d; 17; 19d; 20a; 25a; J 45b; AR 2-4; 3-6; 14-1
  Orchard Peak area, geology: SR 62
  Rosamond uranium prospect: SR 37
  Saltdale quadrangle, geology: B 160
  Walibu quicksilver mine: J 43a
Kern River, sand and gravel deposits: SR 70
Kern River oil field: OM 13; RM 18; AR 1-3; 2-1; 5-3; 7-4, 8; 10-10; 13-7; B 118c
Kernville quadrangle, geology and mineral resources: R 36d
Kettleman Hills oil fields: OM 36; AR 14-5; B 118c
Kings Canyon National Park, geology: SR 53
KINGS COUNTY: B 170
  MINES AND MINERAL RESOURCES: R 14d; 17; 26d; 31d; 49b
  oil fields: AR 3-7
Kingston Range, iron-ore deposits in B 129m
Klamath Mountains, geology: B 179
Klamath Mountains province, chromite in: B 134a
Knoxville district, quicksilver deposits of the: R 41b
Knoxville-Shasta succession, Jurassic and Cretaceous divisions in: R 28c
Kraemer area, Richfield oil field: B 118c
Kramer borate district, Kern County: R 42d
Kreyenhagen shale: R 27b
Kyanite: B 156-3; 176

L

La Goleta gas field: B 118c
La Habra area, Whittier-, geology: SR 18
La Victoria copper mine, Mariposa County: B 144
Ladd chromite deposit, Siskiyou County: R 39a
LAKE COUNTY
  Abbott quicksilver mine: MIS 7-10
  geology: R 11
  Cache Creek, sand and gravel resources: J 54b
  Knoxville district, quicksilver deposits: R 41b
  Lower Lake quadrangle: B 166
  Mayacmas district, quicksilver deposits: R 42c
  MINES AND MINERAL RESOURCES: RM 8; R 8; 10; 11; 14b; 17; 25c; J 43a
  mineral spring resorts: J 50b
  Sulphur Bank quicksilver mine: R 42b
Lake Elsinore quadrangle, geology of: B 146
Lake Hawley iron-ore deposits, Sierra County: B 129*l*
Lakes, alkaline: R 1
  California: R 29a; J 44b
  Pleistocene: B 170f-5; MIS 14-4, 5
Land subsidence: see Subsidence
Landslides
  Lone Mountain: R 32d
  Ventura oil field: MIS 7-5
Las Trampas Ridge, geology: SR 22
LASSEN COUNTY, MINES AND MINERAL RESOURCES: R 8; 9; 10; 11; 15b; 17; 25a; 32d
Last Chance Canyon area, geology: B 170r

Laurel Basin, Mono County, geology: R 30a
Lava Bed district, iron-ore deposits in: B 129b
Lava Cap Gold Mining Corp., mining methods and costs at: R 37c
Law, mining: see Mining law
Lawndale oil field: B 118c
Lead: J 53b; B 156-4; 176; MIS 1-7; 2-11; 9-7
  Darwin quadrangle: SR 51
  Santa Rosa mine, Inyo County: SR 34
  see also Galena, argentiferous
Lead-acid battery industry, mineral needs of: J 48a
Lead-alpha method, age determination by: MIS 13-5
Lead ores, treatment of, smelting: R 8; 10
Lebec quadrangle, geology of: SR 24
Legal guide for California miners and prospectors: SP 22
Leviathan mine, Alpine County, sulphate minerals at: R 35d
Lightweight aggregate: see Aggregate, lightweight
Lilyama mine, El Dorado County: B 144
Lime: B 156; 176; MIS 12-2
  kilns: B 154-1; MIS 12-2
Limestone: B 156-3; 176; MIS 12-2
  agricultural: R 18c; B 155
  industrial uses of: J 45b; 47a
  industry, San Francisco Bay region: B 154-5
LIMESTONE DEPOSITS, CALIFORNIA: J 43c
  bibliography of California: R 18*l*
  Calera, San Mateo and Santa Clara Counties: SR 1B
  Cool-Cave Valley, El Dorado and Placer Counties: J 50c
  Gabilan Range, northern: SR 56
  Gazelle region, Siskiyou County: J 45d
  McCloud River, Shasta County: R 19b
  San Francisco region: R 29b
  Sierra Blanca, Santa Barbara County: SR 1A
  Sonora region, Tuolumne County: J 45d
  Standard quadrangle, south half: SR 58
Lithium: B 176; MIS 4-3
  Pala pegmatites: SR 7A
Lithium compounds: B 176; MIS 6-9; 9-9
Little, James M., necrology: MIS 1-4
Little Tujunga area geology: B 170r
Lompoc diatomite deposits, Santa Barbara County: R 32b
Lompoc oil field: OM 3; B 118c
Lompoc quadrangle, geology of: B 150
Lone Mountain landslides: R 32d
Long Beach oil field: OM 20; AR 7-10; 9-4; 13-11; B 118c; 170r
Los Alamos oil field: OM 2; RM 20
Los Angeles area
  foraminifera: B 170d-5
  geomorphic map of: J 50c
  shaded relief map of: J 50c
Los Angeles basin
  geologic guide: B 170n,p
  geology: B 170c-5
  hydrology: B 170q-1
  oil-producing zones: B 118b
Los Angeles City oil field: RM 13; B 118c
LOS ANGELES COUNTY
  clay industry: MIS 6-10
  geology: R 8; B 170
  Griffith Park area, geology: SR 33
  Lebec quadrangle, geology: SR 24
  MINES AND MINERAL RESOURCES: R 8; 9; 10; 11; 15d; 17; 23c; 33c; J 50c
  oil and gas yielding formations in: B 11
  oil as fuel in: R 13
  oil fields: AR 1-4; 2-2; 3-3

Placerita oil field, geology of: J 46a
Quail quadrangle, southern, geology of: SR 30
residential building-site problems: B 170k-2
Ridge Basin, southern: SR 26
San Fernando quadrangle: B 172
San Gabriel Mountains, geology and mineral deposits: R 33c
San Jose Hills, geology and oil prospects: J 46b
titaniferous iron-ore deposits: B 129p
Whittier-La Habra area, geology: SR 18
Los Angeles field district, mines and mineral resources: R 17; 19; 39a
Los Flores quadrangle, geology: R 34b
Los Olivos quadrangle, geology of: B 150
Lost Hills oil field: OM 11; AR 1-2; 10-1; B 118c
Lower Lake quadrangle, geology: B 166
Lumber, in California: R 2

M

Macdoel quadrangle, geology: B 151
MADERA COUNTY
geology: R 12; 30a
Jesse Belle copper mine: B 144
Minarets district: R 22d; B 129i
MINES AND MINERAL RESOURCES: R 14d; 17; 24d; J 46d
tungsten deposits: R 38c; SR 35
MADERA COUNTY, NORTHEASTERN, geology and mineral resources: R 30a
Magnesite: R 37b; B 156-3
California deposits: R 12; 13; B 79
marketing of: R 40a
Needles deposit, San Bernardino County: J 46c
Red Mountain district: J 46b
San Francisco Bay region: B 154-5
Magnesium: B 156-3; 176; MIS 1-5
compounds: B 156-3; 176
Mammoth mine: SR 28
Mammoth tusks, from Oroville region: R 25a
MANGANESE: PR 3; R 37b; B 156-4; 176; MIS 3-2
mining, southern California: MIS 7-3
purchase program: MIS 4-11; 5-9; 12-8
specifications and prices for: R 37d
MANGANESE DEPOSITS
CALIFORNIA: R 12; 13; B 76; 125; 152; MIS 6-12
Humboldt County: MIS 12-12
Ladd-Buckeye area near Tracy: R 39a
San Francisco Bay area: B 154-5
San Mateo County: R 39b
sea floor: J 51c
Manganese mining, San Joaquin County: MIS 4-6
Mapping, application of aerial photography to: AR 5-9
Map Information Office, U. S. Geological Survey: R 42d; J 43c
Symbols used in U. S. Geological Survey publications: J 45a
MAPS
showing Angeles National Forest withdrawn and patented lands: J 50c
showing areas covered by geologic maps in B 170: B 170a
showing desert fissure springs, San Bernardino County: RM 11
showing distribution of auriferous gravels: B 92
showing distribution of mineral deposits [resources] in California: M 13; F 40b; B 130; 156; MIS 2-10
showing dredging lands adjacent to Feather River: RM 17
showing dredging lands in vicinity of Marysville: RM 21
showing economic minerals of California: B 118b
showing faults, Mojave Desert: B 170e-2
showing forest reserves of California: M 2
showing geologic quadrangles published by Division of Mines: B 133; MIS 3-11
showing geomorphic provinces of California: B 156; 158
showing geomorphology of Los Angeles area: J 50c

showing location of California oil fields: AR 12-2
showing marine sedimentary basins: MIS 7-1
showing mountains of Mojave Desert: RM 11
showing occurrences of radioactive minerals in California: MIS 7-10
showing possible oil lands in California: B 89
showing private land grants in California: M 1
showing progress of topographic and geologic mapping in California: R 40b; B 130
showing relief of California: M3; R 27a; B 118b; 156; 158
showing relief of Los Angeles area: J 50c
showing rivers and creeks that produced placer gold in 1932: M 16; B 135
showing saline deposits in southern California desert regions; M 15
showing Tertiary gravel channels, Nevada County: B 135
showing topography and mineral deposits: M3

MAPS, ECONOMIC MINERAL SERIES
No. 1, quicksilver: M 18
No. 2, oil and gas: B 118c; SR 23; 45
No. 3, chromite: M 19
No. 4, tungsten: R 38c
No. 5, manganese: B 125
No. 6, copper: B 144
No. 7, lead-zinc: J 53b

MAPS, GEOLOGIC
Amador County
western: RM 12; J 50a
ancient channels, between San Andreas and Mokelumne Hill: R 12
ancient channels, Calaveras County: R 12
Berkeley Hills-San Andreas rift: MIS 2-2
CALIFORNIA: M 1; 17; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36; B 72
Coast Ranges, northern: B 179
Contra Costa County: J 54d
El Dorado County: J 52d
Foothill copper belt: R 39d
Forest Hill Divide: R 10
[index to California]: SR 52
Inyo County: M 14
Iowa Hill mining district: R 10
Kings County: J 49b
Klamath Mountains: B 179
Los Angeles Basin: B 170r
Los Angeles County: J 50c
Marin County: J 51c
Mariposa County, northwestern: RM 19
Mayacmas quicksilver district: R 42c
Merced County: J 48c
Mother Lode region: R 10; B 108
Perris block: R 31d
Plumas County: R 33b
Sacramento County: J 51b
San Diego, Orange, San Bernardino Counties, portions of: R 11
San Francisco Bay counties: B 154-3
San Joaquin County: J 51a
San Jose-Mount Hamilton area: B 157
San Mateo County: J 51d
Santa Clara County: J 50b
Santa Monica Mountains: R34b
Shasta County: R 11
Sierra County, western: RM 15
Sierra Nevada, northern, showing Tertiary channels and Mother Lode: R 28c; B 135
Siskiyou County auriferous conglomerate: R 12
Trinity County: R 10
Tuolumne County, southwestern: RM 16
Yuba County: RM 21

see also: Geology, regional; Maps, geologic quadrangle series; Maps, economic mineral series

MAPS, GEOLOGIC QUADRANGLE SERIES
Angels Camp: SR 41
Antioch: B 149
Barstow: B 165
Big Pine: SR 47
Bishop: SR 47
Blue Lake: B 148
Breckenridge Mountain: B 168
Calaveritas: SR 40
Carquinez: B 149
Casa Diablo Mountain: SR 48
Colfax: SR 67
Copperopolis: B 145
Corona: B 159
Corona South: B 178
Cuyamaca Peak: B 159
Dry Canyon: R 34b
Elizabeth Lake: R 30c
Elsinore: B 159
Ferndale: B 164
Foresthill: SR 67
Fortuna: B 164
Gaviota: B 150
Healdsburg: B 161
Hollister: B 143
Jamesburg: R 40b
Kernville: R 36d
Lake Elsinore: B 146
Lebec: SR 24
Lompoc: B 150
Los Flores: R 34b
Los Olivos. B 150
Lower Lake: B 166
Macdoel: B 151
Mare Island: B 149
Mount Tom: SR 47
Mount Vaca: B 149
Neenach: B 153
Ortigalita Peak: B 167
Petaluma: B 149
Point Arguello: B 150
Point Conception: B 150
Point Reyes: B 149
Quail, southern: SR 30
Quien Sabe: B 147
Randsburg: B 95
Red Bluff: R 29a
Redding: R 29a
Saltdale: B 160
San Benito: R 39b
San Fernando: B 172
San Jose-Mt. Hamilton: B 157
San Juan Bautista: B 133
San Luis Rey: B 159
Santa Rosa: B 149
Santa Ysabel: B 177
Scotia: B 164
Sebastopol: B 162
Sonoma: B 149
Sonora: SR 41
Tesla: B 140
Topanga Canyon, western: R 34b

Vacaville: B 149
Weaverville: R 29a
MAPS, MINERAL, copper: B 23; 50
see also: Maps, economic mineral series
MAPS, MINES AND MINERAL DEPOSITS
Alameda County: J 46b
Amador County: RM 12; J 50a
Butte County: RM 17; J 45c
Calaveras County: RM 1
Contra Costa County: J 47d; 54d
Del Norte County: J 48d; B 134a1
El Dorado County, western: RM 6; R 34c; J 52d
Fresno County: J 47c
Glenn County: J 48a
Imperial County: R 38b
Inyo County: RM 7; 9 34d; J 47a
Kern County: RM 18; J 45b
Kings County: J 49b
Lake County: RM 8; J 43a
Los Angeles County: R 33; J 50c
Madera County: J 46d
Marin County: J 51c
Mariposa County: RM 19; J 53a
gold mines: R 31a
Mendocino County: J 49c
Merced County: J 48c
Mono County: R 36b
Nevada County: RM 5
Placer County: RM 9
Plumas County: RM 2; R 33b
Riverside County: R 41c
Sacramento County: J 51b
San Bernardino County: RM 11; R 26c; 39d; 49a
San Diego County: RM 14; R 35a
San Joaquin County: J 51a
San Mateo County: J 51d
Santa Barbara County: RM 20
Santa Clara County: J 50b
Shasta County: RM 10; R 35b
Sierra County: RM 15
Siskiyou County: RM 3; R 31c; J 43d
Sonoma County: J 46a
Stanislaus County: J 43b
Tehama County: R 42c
Trinity County: RM 4; R 37a
Tulare County: R 54c
Tuolumne County: RM 16; J 45a
Yolo County: J 46c
Yuba County: RM 21; J 48b
See also: Maps, geologic quadrangle series
MAPS, MINING CLAIM, Grass Valley district: R 37c
Minaret district: M 4
Mother Lode belt in Amador, Calaveras, El Dorado, and Mariposa Counties: B 108
Nevada City district: R 37c
Nevada County, western: R 37c
MAPS, NATIONAL FOREST, El Dorado County: M 12
Madera County: M 5
Placer County: M 6
Shasta County: M 7
Sierra County: M 8
Siskiyou County: M 9
Trinity County: M 10
Tuolumne County: M 11

MAPS, OIL FIELD
Arroyo Grande: OM 19
Bardsdale: OM 17
Belridge: OM 10; 11
Brea Canyon: OM 4
Buena Vista Hills: OM 8
CALIFORNIA: B 118c
Camarillo: OM 17
Casmalia: OM 3
Cat Canyon: OM 2
Coalinga: OM 14
Coyote, East: OM 4
Coyote, West: OM 5
Devils Den: OM 12
District 1 (Los Angeles and Orange Counties): OM 25
District 2 (Ventura County): OM 24
District 3 (Santa Barbara County): OM 23
District 4 (Kern and Kings Counties): OM 21; 22
Dominguez: OM 29
Elk Hills: OM 15
Fullerton: OM 4, 5
Huntington Beach: OM 26
Inglewood: OM 31
Kern River: OM 13
Kettleman Hills: OM 36
Lompoc: OM 3
Long Beach: OM 20
Los Alamos: OM 2
Los Angeles City: RM 13
Los Angeles County: J 50c
Lost Hills: OM 11
McKittrick: OM 9
McKittrick Front: OM 10
Midway, North: OM 9
Midway, South: OM 8
Montebello: OM 5
Mount Poso: OM 34
Newhall: OM 18
Oil City fields, Fresno County: B 15
Ojai: OM 16
Olinda: OM 4
Piru: OM 18
Puente Hills: OM 4
Richfield: OM 4
Rincon: OM 33
Rosecrans: OM 30
Round Mountain: OM 35
Salt Lake: OM 6
San Emidio: OM 7
Santa Fe Springs: OM 27
Santa Maria: OM 2; 3
Santa Paula: OM 17
Sargent: OM 1
Seal Beach: OM 32
Sespe: OM 17
Simi: OM 18
South Mountain: OM 17
Sunset: OM 7
Torrance: OM 28
Ventura: OM 16
Whittier: OM 4, 5
see also: MAPS, Township plats of oil fields
Maps, relief model of California: MIS 6-4

MAPS, SHADED RELIEF
California: B 158
Los Angeles area: J 50c
Maps, topographic: see also Topographic maps
MAPS, TOPOGRAPHIC, COUNTY
Del Norte: B 134 a1
Siskiyou: B 134 a2
Maps, topographic quadrangle: see Maps, geologic quadrangle series
Maps, township plats of oil fields: AR 1-1; 2-1; 3-1; 5-2; 6-2; 7-2; 8-2; 9-2; 10-2; 11-2; 12-2; 13-2; 14-2
Maps, used in mineral investigations: MIS 13-2
Mare Island quadrangle, geology of: B 149
Maricopa shale, oil from: AR 12-11
MARIN COUNTY
geologic guidebook: B 154
Mare Island quadrangle, geology of: B 149
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14b; 17; 22c; J 51c
nephrite in: SR 10B
Petaluma quadrangle, geology of: B 149
Point Reyes quadrangle, geology of: B 149
San Andreas fault in: SR 57
Marine geology, bibliography of: SR 44
MARIPOSA COUNTY
American Eagle-Blue Moon zinc deposits: B 144
chromite: B 134 c1
geology: R 12
La Victoria copper mine: B 144
MINES AND MINERAL RESOURCES: RM 19; R 8; 10; 14d; 17; 24b; J 53a
MARKETS, MARKETING: see Mineral economics
Marl, agricultural: B 155
Marysville Buttes gas field: R 39c; B 118c
Mayacmas district, quicksilver deposits: R 42c; MIS 4-6
McDonald Island gas field: B 118c
McKittrick oil field: OM 9; RM 18; AR 1-3; B 118c
McKittrick Front oil field: OM 10
Meadow Lake district, Nevada County, gold veins: R 32b
Meetings and conferences, announcements of
American Association of Petroleum Geologists: MIS 2-11; 7-10; 9-10; 11-3
American Ceramic Society: MIS 4-10; 7-10
American Institute of Mining & Metallurgical Engineers: MIS 1-10; 2-2, 4, 10; 3-4, 9; 4-10; 8-10; 9-4, 10; 12-2; 13-1; 14-3
American Mining Congress: MIS 1-8, 9; 2-10; 4-10; 9-10; 11-9
American State Geologists: MIS 2-4
California Association of Engineering Geologists: 12-9; 13-10
California Chamber of Commerce: 4-10
Clay Industries Conference, University of California: MIS 5-1, 6, 7
Ceramic Engineering Fundamentals, University of California: MIS 2-10
Duluth Conference: MIS 12-11
Exploration for Nuclear Raw Materials: MIS 9-12
Fifth Empire Mining and Metallurgical Congress (Australia): MIS 5-4
Gem and Lapidary Show: MIS 6-6
Geological Society of America: MIS 2-10; 5-4; 7-10; 14-3
International Mineral Dressing Congress: MIS 10-3
Oil Progress Week: MIS 10-11
Pacific Coast Regional Conference on Clays, 1954: MIS 7-4, 6
Pacific Southwest Mineral Industry Conference: MIS 9-10
San Bernardino County Fair: MIS 4-10
San Francisco Chamber of Commerce: MIS 9-11
Seventh Annual Conference on City and Regional Planning: MIS 12-8
Sixth Clay Conference: MIS 10-5, 8; 11-4
Sixth Commonwealth Mining and Metallurgical Congress: MIS 10-6
Western Governors Minerals Policy Conference: MIS 8-6; 10-8
see also: Exhibits

MENDOCINO COUNTY, carbon-dioxide gas: R 39c
geology: R 10; J 49c
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14c; 17; 19d; 25d; 49c
Mendota Canal, Delta-, geology of: SR 2
MERCED COUNTY
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14d; 17; 21d; J 48c
Moreno formation in: SR 9
Ortigalita Peak quadrangle: B 167
Quien Sabe quadrangle, geology of: B 147
Stayton district, quicksilver and antimony in: B 147
Mercury: MIS 3-11; 10-11
changing gold to: MIS 10-12
mining, Mayacmas district: MIS 4-6
see also: Quicksilver
Mesozoic, in California: B 118b
in southern California: B 170d-3
Metallurgical works, need for: R 1
METALLURGY AND ORE-DRESSING, Belmont Shawmut mine, Tuolumne County: R 18*l*
chlorination: R 6b
complex ores: B 144
concentration of gold and silver ores: R 6b
condenser installation at New Idria Quicksilver Mining Co.: J 43a
cyanide process: R 10; 27b; 34c; B 5
hydrometallurgy of gold: R 8
hydrometallurgy of silver: R 8
milling of gold quartz: R 2; 6; 8; B 6
Penn mine slag dump: J 45a
platinum: R 18d
quicksilver: B 78
Russell process, lead-silver ores: R 8
smelting of lead ores: R 8; 10
titanium: R 23c
treatment of flour gold: R 2
use of producer-gas as fuel: R 10
Metamorphism, in southern California: B 170h-6,7
Meteorites: R 10
Goose Lake: R 35c
Meteorological observations: R 9
Mica: R 2; 40d; B 156-3; 176; MIS 1-8; 5-10; 7-4
synthetic: MIS 6-11
see also: Vermiculite
Microfossils, bibliography of: SR 66
Midway quadrangle, Delta-Mendota Canal in: SR 2
Midway-Sunset oil field: OM 8; 9; PR 2; RM 18; AR 1-3, 6; 5-1, 6; 6-8; 7-7; 12-1, 10; B 118c
Milling: see Metallurgy and ore dressing
Millspaugh iron deposit, Inyo County: R 42d
Minarets district, Madera County: M 4; R 22d; B 129i
Mineral commodities
California: B 156
see also under commodity names, and Statistics
Mineral deposits, sampling: MIS 13-11
MINERAL DISCOVERY AND DEVELOPMENT, HISTORY OF
De argento vivo: J 49c
Elephant, The: J 45d
Fabricas: J 48b
MINERAL ECONOMICS: B 130; 156
agricultural minerals: B 155; MIS 1-2; 2-7
ceramic industry, needs of: MIS 2-4
chemicals, northern California markets for: J 46c
clay: B 99; 169
coated welding electrodes: J 51a
costs of mining and concentrating chromite: R 36b
costs of trucking and packing gold ore: R 35c

economic aspects of mercury production: J 44d
exploration costs of small mines: MIS 13-12
glass industry, minerals in: MIS 5-10
glass container industry, mineral needs of: MIS 2-9
lead-acid battery industry, mineral needs of: J 48a
industrial uses of limestone and dolomite: J 45b
manganese: B 125
marketing: MIS 4-3, 4, 5, 6, 7, 8, 9, 11, 12; 5-2, 4, 5, 6, 7, 10, 11; 6-1, 3, 4, 7, 10, 11; 7-2, 3, 4, 6, 7, 8, 10, 12; 8-4, 8, 9, 10; 9-3, 6, 7, 9, 11; 10-12; 11-1, 11; 12-4, 5, 6; 13-1, 8
chrome: MIS 4-10; 9-9
commercial minerals: B 87
complex ores: B 144
magnesite: R 40a
manganese: MIS 5-9; 8-3; 12-8
need for information on: MIS 4-1
quicksilver: MIS 7-10; 10-7
talc, pyrophyllite, and ground soapstone: R 37b
tungsten: MIS 4-9; 5-12; 9-4, 9, 10
uranium: MIS 7-11; 12-1
vermiculite: R 40d
markets, Los Angeles area: MIS 4-10
mineral utilization, San Francisco Bay region: B 154-5
mining, metal, and petroleum industry: MIS 14-4
new Mint charges: MIS 11-9
new use for quicksilver: R 41b
oil and gas industry: B 118a; SR 23
paint industry
as consumer of chemicals: MIS 2-3
talc in: J 48c
petroleum industry: MIS 14-4
mineral needs of: MIS 3-1
price of gold: R 37c
problems of mineral industry: 36d
prospect for minor metals and nonmetallics: R 35a
pulp and paper industry, chemicals used in: J 45c; MIS 2-2
raw materials, California's contribution to San Francisco industries: B 154-5
roofing granules: J 45c
roofing industry, mineral needs of bituminous-base: J 47c
rubber industry, minerals used in: J 45d; MIS 2-6
San Francisco Bay region: B 154-5
small mines, developing: MIS 11-12
specifications and prices for manganese and chrome: R 37d
specifications for mineral products: MIS 7-10
substitutes for minerals: MIS 13-8
talc in paint industry: J 48c
tariff rates: MIS 4-1; 9
see also under individual minerals, Statistics, and Mining law
Mineral filler: MIS 4-11; 12
Mineral fuels
San Francisco Bay region: B 154-5
see also: Coal, natural gas, petroleum
Mineral industry
Alameda County: MIS 2-1
effect of urbanization on: SP 30
Mineral Information Service
authorship: MIS 12-8
back issues available: MIS 6-8
corrections: MIS 6-7, 9; 7-9, 12; 8-2
distribution: MIS 14-8
indexes:
vols. 1-2: MIS 2-12
vol. 3: MIS 4-1
vol. 4: MIS 4-12
vol. 5: MIS 6-1

vols. 1-6, consolidated: MIS 7-1
vol. 7: MIS 7-12
vol. 8: MIS 9-1
vol. 9: MIS 9-12
vols. 1-10, consolidated: MIS 10-12
vol. 11: MIS 12-1
vol. 12: MIS 12-12
vol. 13: MIS 14-1
supplements to
Available publications, California Division of Mines, November 1957: MIS 10-11
Available publications, California Division of Mines, November 1958: MIS 11-12
Available publications, California Division of Mines, March 1960: MIS 13-3
Excursion through the San Francisco Bay area: MIS 2-2
Geologic log for Ventura Basin field trip: MIS 6-2
Legal guide for California prospectors and miners: MIS 5-7
Mineral kingdom, the: MIS 14-7, 8
Mineral paint deposits, California: R 26b
Mineral pigment tests: R 25a
Mineral producers: MIS 2-4
see also statistical bulletins, annual reports of State Mineralogist and State Oil and Gas Supervisor
Mineral pigments: MIS 2-6
see also: Mineral paint
Mineral production of California: see Statistics, California mineral production
Mineral rights: MIS 14-2
Mineral springs: see Springs, mineral
Mineral utilization
age of: R 32c
Bay area: MIS 5-2
in coated welding electrodes: J 51a
Mineralization, plants as a guide to: SR 50
Mineralogy
beach sands: SR 59
clay: B 169
mineral kingdom: MIS 14-7, 8
southern California: B 170h
Minerals
California: see California, minerals of
classification of: MIS 14-7, 8
San Francisco Bay area: B 154-7
southern California: B 170h-1
strategic: see Strategic minerals
Minerals policy, Western Governors: J 52b

MINING
current activity in: MIS 1-1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12; 2-1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12; 3-1, 3, 4, 5, 7, 8, 9, 10, 11, 12; 4-2, 3, 4, 6, 8, 9, 10, 11, 12; 5-4, 6, 7, 12; 6-2, 3, 4, 8, 12; 7-4, 7; 9-1, 6, 7, 9; 10-3, 4; 11-5; 12-1, 5; 14-3
development of prospect into mine: R 32b
drainage in: R 6b; B 9
economics of small-scale: MIS 11-12
exploitation of small mines and prospects: R 18b
exploration costs: MIS 13-12
glossary of terms used in: R 2
hydraulic filling: SR 12; MIS 3-1
measuring ore bodies: R 13
methods and costs at Lava Cap Gold Mining Corp.: R 37c
methods of timbering: B 2
oil sands: R 18f
preservation of timbers: R 13
sampling mineral deposits: MIS 13-11
sampling ore bodies: R 13
use of compressed air in: R 13
use of electricity in: R 12; 13

valuation of properties: R 18h
see also under particular minerals
Mining Advisory Council: J 52d
Mining and Industrial News Notes: see Mining, current activity in
Mining labor and the draft: MIS 3-12
MINING LAW: SP 27; R 6b; 7; 21a; 29b; 31c; 39c; 41c; B 66; 70; 71; 130
acquiring mining claims through tax title: R 28c
Act defining hydraulic mining: R 12
Act establishing mine-bell signals: R 12
Act for development and control of atomic energy: J 45b
Act regulating mineral, oil and gas brokers and salesmen: R 40d
agricultural minerals act: R 19d
Alien Act amendment: R 8
AMERICAN: R 11 24c; B 75; 98; 123
assessment work: R 18e; 25c; 26b; 29a; 30c; 32c; 35c; 38b; 40d; MIS 3-7, 8; 6-6; 8-5; 10-11; 13-10
CALIFORNIA: R 24c; 37c; J 44a; 46b; B 56; 60; 66; 70; 71; 75; 106; 120; 127; 138; MIS 5-7
Caminetti Act: R 12; 34c; B 135
conservation of petroleum and gas: AR 7-2
control of California oil lands: AR 6-4
Death Valley National Monument open to mining: R 30c; MIS 8-8
Debris Commission Act: R 12
debris control: R 33b
definition of gas, gasoline and petroleum: R 22c
definition of hydraulic mining: B 135
Eagle Bird mine suit: R 10
Federal revenue act: R 22b
fish and game districts: R 27c; B 135
grubstake permits: R 31b
high-grade bill: SP 26; R 23c; 25c
in recent years: J 44c; 45c; 46d
Joshua Tree National Monument: R 32c
lands open to location: MIS 5-4; 9-5; 12-6; 14-3, 7, 8
lands open to mining: R 20c; 24c; MIS 10-12
leasing system applied to metal mining: R 31c
legal guide for California prospectors and miners: MIS 5-7; 6-7
legislative control in mineral industry: B 130
license requirements: R 20c
licensing of gold and silver dealers: R 21c
location of claims: R 10; see also mining law, California
location on stock-raising lands: R 19b
location work: MIS 6-6
millsites: MIS 13-7
mine financing: R 31c
mine taxation: R 35b
mineral patents: J 43a
mineral rights: MIS 14-2
mining claims on public domain: J 43a
miscellaneous legislation: MIS 11-10
multiple mineral development: MIS 7-10
multiple use: MIS 8-10; 9-11
national parks and monuments, mining in: MIS 8-8
needed changes in statutory and administrative law: B 130
oil and gas rights: R 20b,c,d
Ore Buyers' License Act: SP 26; R 23c; 25c
power permits on navigable streams: R 37a
power sites, mining on: MIS 8-12; 10-12; 11-11
price control lifted: MIS 6-4
publications on: MIS 3-9
Reconstruction Finance Corp. loans: R 31a
recording fees: MIS 11-4
relocation of claims: R 42a
Securities Act of 1933: R 37a
sources of information on: MIS 12-3

State Lands Act: R 34c
Strategic Minerals Act: R 35c
stream beds, mining in: MIS 12-11
surface rights: MIS 13-4, 8, 10; 14-2, 4, 6, 7
in national forests: R 25c
to unpatented claims: MIS 9-9; 11
survey corners: MIS 13-8
tariff on nonmetallics: R 27a; 28a
tax, computation of: MIS 10-12; 13-10
tax exemptions and loans for strategic minerals: R 36d
Tidelands oil bill: MIS 10-8
U. S. Patents in California: R 8
water rights: R 8; MIS 12-5
withdrawals: MIS 12-12; 13-3, 8; 14-2
bristlecone pine: MIS 11-10
Death Valley: MIS 12-12
Saline Valley, Inyo County: MIS 8-8
single-use: MIS 12-12
Twenty-nine Palms: MIS 12-8
wild life: MIS 10-9; 10
Minor metals: B 176
Miocene, correlation of formations in California: B 118b
volcanism, southern California: B 170h-4
Missions, California: J 48b
MODOC COUNTY, MINES AND MINERAL RESOURCES: R 8; 10; 15b; 17; 25a; 32d
Mojave Desert
clay minerals in playas: SR 69
drainage: B 170g-5
faulting: B 170e-2
geologic guide: B 170*l*
geology: 170c-1
dry placers: R 30c
gold: B 170i-6
hydrology: B 170f-2
lakes: B 170g-5
map showing mountains of: RM 11
metamorphic and igneous rocks: B 170h-2
saline deposits: MIS 10-8
silver: B 170i-6
Mojave mining district, mining activity in: R 31d
Molybdenum: PR 4; B 156-4; 176; MIS 1-10; 4-11; 8-11
in tungsten ores: MIS 5-4
new methods for determination of: R 39a
Monazite: MIS 3-3
see also under Rare earths
MONO COUNTY
Casa Diablo Mountain quadrangle: SR 48
geology: R 8; 26d; 30a; B 170
MINES AND MINERAL RESOURCES: R 8; 10; 12; 15a; 17; 18i; 23d; 36b
MONO COUNTY, SOUTHWESTERN, geology and mineral deposits: R 30a
Mono Craters tunnel, formations encountered in driving: R 36b
Montebello oil field: OM 5; AR 5-11; B 118c
Monterey Bay
mineralogy of beach sands: SR 59
sediments of: R 28a
MONTEREY COUNTY, building stone from Carmel Valley: R 28a
Gabilan Range, limestone and dolomite in: SR 56
geology: R 12
Hollister quadrangle, geology of: B 143
MINES AND MINERAL RESOURCES: R 8; 10; 11; 15e; 17; 21a; 31d
nephrite in: SR 10A
oil fields: AR 2-3; 3-5
Pfeiffer Big Sur State Park, geology: SR 11
phosphorite from Carmel Valley: R 40d

Moody Gulch oil field: B 118c
Moreno formation: SR 9
Mother Lode, geology of: R 10; 13; 28c; B 18; 108; 141
Mount Diablo region, geology and oil possibilities: B 118c
Mount Jackson quicksilver mine: MIS 7-10
Mount Poso oil field: OM 34; AR 12-7
Mount St. Helena, geology: R 6a
Mount Vaca quadrangle, geology of: B 149
Mountain Copper Co., Ltd., The, cyanide treatment of gossan: R 27b; 34c
  fifty years of operation in Shasta County: J 43b
Mountain Pass rare-earth deposits: B 170i-3; MIS 5-7
Mountain View oil field: B 118c
Mud volcanoes, in Colorado Desert: R 2
Murrietta area, geology: B 170r
Mylonites, in eastern San Gabriel Mountains. R 39b

N

NAPA COUNTY
  geologic guidebook: B 154
  geology: R 11
  Knoxville district quicksilver deposits: R 41b
  Mayacmas district quicksilver deposits: R 42c
  MINES AND MINERAL RESOURCES: R 8; 10; 14b; 17; 25b; J 44b
  Mount Vaca quadrangle, geology of: B149
  Oakville district quicksilver deposits: J 45a
  Santa Rosa quadrangle, geology of: B 149
  Sonoma quadrangle, geology of: B 149
National minerals policy, recommendations for: MIS 9-3; 10-8
Natural gas
  Buena Vista field: AR 8-2
  Buttonwillow area: AR 7-3
  California: AR 11-9; R 7; 12; 13; B 3; 11; 19; 73; 82; 84; 118a; 156-2; 170j; 176; SR 23; 45
  conservation of: AR 11-9; 12-9; 13-9
  current developments: MIS 1-11
  Elk Hills field: AR 4-3
  extraction of gasoline from: AR 1-6
  production measurement: AR 14-6
  Summerland, Santa Barbara County: R 10
  technology of: AR 14-10
  Tulare Lake field: AR 5-6; 8-1
  variables in production and utilization: AR 13-10
  Ventura (Avenue) field: AR 11-10
  see also: Mineral fuels; field names
Natural-gas liquids: B 176
Natural gasoline, California: B 156-2
Necrology
  Bert Austin: MIS 13-10
  Charles V. Averill: MIS 3-10
  Walter W. Bradley: MIS 3-5
  F. C. Van Deinse: MIS 8-8
  George W. Hallock: MIS 8-7, 8
  Fletcher M. Hamilton: MIS 12-1
  Warren T. Hannum: MIS 9-10
  Hubert O. Jenkins: MIS 12-6
  James M. Little: MIS 1-4
Needles magnesite deposit, San Bernardino County: J 46c
Needles-Goffs region, San Bernardino County, geology of: R 40a
Nelson, DeWitt: MIS 12-1
Nepheline syenite: MIS 5-2
Nephrite: SR 10A,B
Nevada, borax in: R 3, pt. 2
NEVADA COUNTY, gold veins of Meadow Lake district: R 32b
  MINES AND MINERAL RESOURCES: RM 5; R 6b; 8; 10; 11; 16a; 17; 20d; 26b; 37c

New Almaden quicksilver deposits: B 154-5; SR 17
New Idria district quicksilver deposits: R 39a; 42b; MIS 7-10
New Idria Quicksilver Mining Co., condenser installation at: J 43a
New Orleans World's Industrial and Cotton Centennial Exposition, 1884-85, California participation in: R 5
Newberry Mountains, geology and mineral deposits: R 36c
Newhall oil field: OM 18; B 118c
Newport oil field: B 118c
Newton copper mine, Amador County: B 144
Nickel: PR 5; B 176; MIS 1-11
  California: MIS 7-11
  deposits, Julian-Cuyamaca area, San Diego County: R 42a
  history of the name: R 37c
Niobium: MIS 4-5; 12-3
  use of term: MIS 4-7
  see also: Columbium
Nitrogen compounds: B 156-3; 176
Nonmetallics, southern California: B 170i-7
Nopah region, Paleozoic section in: R 33d
Norman, L. A., leaves Division: MIS 9-1
North Star Mining Co., transmission plant for: R 13

O

Oakeshott, Gordon B.: MIS 11-4
Oakville district, Napa County, quicksilver in: J 45a
Obituaries, see Necrology
Obsidian: MIS 4-10
Oceanography, bibliography of: SR 44
Oceanside area, geology: B 170c-4
Office of Mineral Resources: MIS 12-5
Office of Minerals Exploration: MIS 12-2; 12; 13-11
Office of Price Stabilization: MIS 6-4
Oil: MIS 5-6
  combusion-drive project: MIS 7-9; 9-9
  current developments: MIS 1-11
  man-made island for drilling: MIS 7-9; 8-2; 10-6; 12-5
  mining for: MIS 7-4
  Tidelands bill signed: MIS 10-8
  see also: Petroleum
Oil-field operations
  Districts 1-5: AR 7-8; 8-8; 9-8; 10-10; 11-8; 12-8; 13-8; 14-8;
  supervision of: AR 9-3
Oil fields
  maps showing: OM 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12 ;13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36
  township plats showing: AR 1-1; 2-1; 3-1; 5-2; 6-2; 7-2; 8-2; 9-2; 10-2; 11-2; 12-2; 13-2; 14-2
  see also under names of individual oil fields
Oil lands
  control of California: AR 6-4
  proved: AR 7-2; see also Oil fields, township plats showing
Oil operators, directory of: AR 1-6; 2-6; 3-8; 7-2; 10-2; 11-2; 12-2; 13-2; 14-2
Oil properties, valuation of: SP 31; R 18h
Oil sands, mining: R 18f
Oil shale, Santa Barbara County: R 19d
Oil supply, California: AR 6-1
Oil wells
  depth records: MIS 4-5
  spacing: AR 6-7
Ojai area, oil fields: B 170r
Ojai oil field: OM 16
Old Dad Mountain iron-ore deposit, San Bernardino County: B 129d
Oleate solutions, flotation of titanium: J 49b
Olema, lime kilns near: B 154-1

Oligocene, sequence of formations in California: B 118b
Olinda oil field: OM 4
OME: see Office of Minerals Exploration
OPS: see Office of Price Stabilization
ORANGE COUNTY: B 170
  Burruel Ridge area, geology: SR 21
  clay deposits: R 31a; MIS 6-10
  geology: R 11; 17
  Lake Elsinore quadrangle, geology of: B 146
  MINES AND MINERAL RESOURCES; R 10; 15d; 21a
  oil fields: AR 1-4; 2-2; 3-3
Orchard Peak area, geology: SR 62
Orcutt (Santa Maria) oil field: B 118c
Ord Mountains, geology and mineral deposits: R 36c
Ore-dressing: see Metallurgy and ore-dressing
Otay bentonite deposit: SR 64
Ortigalita Peak quadrangle, geology: B 167
Owens Lake, soda ash at: MIS 12-10
Owens Valley, geology: B 170r

P

Pacific Coast Mineral Exposition: R 3 pt. 1; 4
Pacific slope, ethnology and geology: R 2
Paint industry
  California talc in: J 48c
  chemicals used in: MIS 2-3
Pajaroello: see Ticks
Pala pegmatites: SR 7A
Palen Mountains gypsum deposit: SR 36
PALEOBOTANY
  diatoms: R 18b; 27b; B 154-5
  fossil plants
    San Francisco Bay region: B 154-4
    Sierra Nevada: R 28c
  see also: Fossils
PALEONTOLOGY
  Big Bend quadrangle, southwest quarter: SR 63
  catalogue of California fossils: R 7; B 4
  characteristic fossils of California: B118b
  Cretaceous microfossils, bibliography: SR 66
  foraminifera, California: B 118b
    from Kreyenhagen shale: R 27b
  invertebrate, San Francisco Bay region: B 154-4
  mammoth tusks: R 25a
  silicoflagellates, from Kreyenhagen shale: R 27b
  southern California: B 170d
  vertebrate, San Francisco Bay region: B 154-4
  see also: Fossils
Paleozoic
  Nopah and Resting Springs region: R 33d
  southern California: B 170d-2
Palm Springs-Blythe strip, geology of: R 40a
Panamint Range, geology and mineral resources: R 28c
Paper industry, western: J 54c; MIS 2-2
Paskenta region, geology and oil possibilities: B 118c
Pastoria Creek area: B 170r
Peat: MIS 9-12
  deposits, California: R 18c; B 156-2
Pebbles, grinding: B 156-3
Pegmatites
  Pala district: SR 7A
  Rincon: SR 7B
  southern California: B 170h-5
Peninsular Ranges
  geologic guide: B 170q
  geology: R 31b; B 170c-3

Penn zinc-copper mine, Calaveras County: J 45a; B 144
Perlite: J 44c; B 156-3; 176; MIS 1-4
  processing: J 51b; MIS 6-7
  see also: Volcanic rocks
Perlite deposits, Sonoma County: J 46a
Perlite discovery, San Benito County: MIS 6-6
Perlite industry, Los Angeles area: MIS 4-4
Perris block, geology and mineral resources: R 31d
Petaluma quadrangle, geology of: B 149
Petaluma region, geology and oil possibilities: B 118c
Petrography, grain size, sedimentary rocks: MIS 13-9
  Poe tunnel: SR 61
PETROLEUM: R 7; 13; MIS 1-7; 4-9, 11
  analysis of California: B 31
  Belridge field: AR 1-2; 10-1
  Buttonwillow area: AR 7-3
  Caliente Range, Cuyama Valley, Carrizzo Plain: R 35c
  CALIFORNIA: AR 6-7; R 7; 12; 13; 34a; B 3; 11; 16; 19; 32; 63; 69; 73; 82; 84; 89; 118; 156-2; 176; 170j; SR 23; 45; MIS 7-1; 11-3
  Casmalia field: OM 3; AR 5-10
  Coalinga field: AR 1-2
  Devils Den field: AR 9-12
  Dominguez field: AR 10-7; 12-4
  Elk Hills field: AR 4-3; 7-1
  Fresno County: AR 2-5; 3-7
  genesis of California: B 16
  Hovey Hills field: AR 9-12
  Huntington Beach field: AR 7-5; 9-6, 9; 12-12
  Imperial Valley explorations: AR 5-10
  Inglewood field: AR 11-12
  Inyo County: AR 3-6
  Kern River field: AR 1-3; 13-7
  Kern County: AR 2-4; 3-6; 14-1
  Kettleman Hills field: AR 14-5
  Kings County: AR 3-7
  Long Beach field: AR 7-10; 9-4; 13-11
  Los Angeles County: AR 1-4; 2-2; 3-3
  Lost Hills field: AR 1-2; 10-1
  McKittrick field: AR 1-3
  Midway-Sunset field: AR 1-3; 12-1
  Montebello field: AR 5-11
  Monterey County: AR 2-3; 3-5
  Mount Poso field: AR 12-7
  North Belridge field: AR 10-1
  Oil City fields, Fresno County: B 15
  Orange County: AR 1-4; 2-2; 3-3
  Pico Canyon oil field: R 10
  Placerita field, Los Angeles County: J 46a; B 170r; MIS 2-1
  Poso Creek field: AR 10-1
  Register of wells, Los Angeles City: RM 13
  Richfield field: AR 12-6
  Rosecrans field: AR 11-5
  San Diego County, southwestern: R 35a
  San Jose Hills, western: J 46b
  San Luis Obispo County: AR 2-3; 3-5
  Santa Barbara County: AR 2-3; 3-5
  Santa Clara County: AR 2-3; 3-5
  Santa Fe Springs: AR 8-11; 14-7
  Santa Maria district: AR 1-5
  Seal Beach field: AR 13-3
  statistics: see under Statistics
  Sunset field: AR 9-5; 12-11
  Sunset Extension field: AR 9-12
  Torrance field: AR 11-3
  Tulare County: AR 3-6

unproved areas in California: B 89
Ventura [Avenue] field: AR 5-8; 6-6
landslides in: MIS 7-5
Ventura County: AR 1-4; 2-2; 3-4; 10-5
Wheeler Ridge field: AR 9-12
wildcat drilling: AR 11-1
see also: Oil, Mineral fuels, and under names of individual fields
PETROLEUM ENGINEERING: B 116
abandoning wells: AR 5-7, 12
automatic bailer: AR 7-9
casing measurement: AR 5-5
casing perforation: AR 4-4; 5-7
casing removal methods: AR 2-1; 7-6
casing welding: AR 7-4
cementing: AR 6-6; 11-4; 13-5; 14-3
cleaning wells: AR 9-7
completing a well: AR 8-10; 13-4
core drilling: AR 6-12; 7-9; 8-1; 9-11
core sampling: AR 9-11; see also Core drilling
derrick failure: AR 1-6
determining fluid content of formations: AR 9-9
drilling tools: AR 10-9
drilling wells: AR 3-2; 6-2; 7-6, 7
effect of closing in production: AR 11-6
efficiency of wells: AR 10-7
extraction of gasoline from natural gas: AR 1-6
gasoline plants in Midway oil field: AR 1-6
graphic interpretation of water analysis: AR 6-9
graphic methods of maintaining oil-well statistics: AR 5-9
handling heavy crude oil: AR 8-6
heavy minerals in drilling muds: AR 12-3
hydraulic cement use: AR 14-3
increasing production: AR 5-12; 13-9
long shoe: AR 10-10
long water strings: AR 13-5
losses into low-pressure sands: AR 12-5
lubricating drill collars: AR 7-7
measuring fluid: AR 13-6
measuring natural gas production: AR 14-6
mechanical control of flowing wells: AR 9-10
mud fluid in drilling: AR 6-2; 7-6; 8-7; 12-3
mudding wells: AR 2-1; 3-1; 5-5, 7; 6-10; 7-3; 8-7
natural-gas technology: AR 14-10
offshore drilling: MIS 5-8; 12-5
oil and gas separator: AR 7-11
oil and water production: AR 6-3
oil-field operations, comparison of efficiency: AR 5-4
oil-well shooting: AR 2-1
peg model construction: AR 6-11
plugging wells: AR 2-1; 5-12
plunger rotators: AR 10-4
power equipment for wells: AR 8-4
problems in South Mountain field: AR 7-12
production and use of California: B 32; 156-2; 176; see also Statistics
production records: AR 13-6
prospect wells: AR 6-9
proved oil land: AR 7-2; 8-2
pumping equipment: AR 11-11
recementing wells: AR 6-1
recovering oil by perforating water string: AR 9-1
recovery plants: AR 6-8
reducing oil viscosity: AR 3-1
repairing wells: AR 5-9
resin for excluding water from wells: AR 8-12

rotary drilling: AR 6-12; 7-9; 8-7; 12-3; 13-1
steel casing collapsing strength: AR 1-6
subsurface formations: AR 10-3; 11-7
tables: AR 14-4
testing formations: AR 4-4
tools: AR 8-3; 13-1
uniform penetration of zones: AR 14-9
variables in production and utilization of natural gas: AR 13-10
water, locating source of: AR 10-12
water analysis: AR 10-6
water-damage to wells: AR 5-1, 3, 6; 8-12; PR 1; 2
water encroachment: AR 5-4; 7-4; 8-7
water-flooding, increasing production by: J 45b, c, d; MIS 2-2
water in emulsions: AR 8-5
water shut-off: AR 1-6; 2-1; 3-2; 5-7, 12
water sources: AR 5-8
water string, landing and cementing: 13-5
water string, perforating: AR 9-1
well production, measuring and recording: AR 4-4
well spacing: AR 6-7
world's deepest wells: MIS 7-1; 8-4
Petroleum gases, liquefied: B 156-2
Petroleum industry
clay in: B 169
effect of strike on: AR 7-8
mineral needs of: MIS 3-1
Petroleum law: see under Mining law
Petrology, southern California: B 170h
Pfeiffer Big Sur State Park, guide to geology: SR 11
Phosphates: B 156-3; 176; MIS 2-1
Phosphorite deposits
Carmel Valley: R 40d
submarine: J 46a
Photogeology: SR 15
See also: Aerial photography
Pico Canyon oil field: R 10
Piedmontite, discovery in Sierra Nevada: R 29a
Pine Creek tungsten mine, Inyo County: R 41d; MIS 3-2
Mountain area, Ventura County, geology: B 170r
Pioneer copper mine, El Dorado County: B 144
Piru oil field: OM 18; B 118c
Place names, San Francisco Bay counties: B 154-1
PLACER COUNTY
Cool-Cave Valley limestone: J 50c
Duncan Canyon region, ancient channels in: R 21c
gold mines: R 32a
MINES AND MINERAL RESOURCES: RM 9; R 8; 10; 11; 15c; 17; 23c
Placer deposits: see Gold, geology of placer
mining for gold in California: B 135
Placerita oil field, Los Angeles County, geology: J 46a; B 170r; MIS 2-1
Placers, new technique applicable to study of: R 31b
Plants, as guide to mineralization: SR 50
Platinum: R 1; B 176
DEPOSITS, California: B 85
machines for recovery of: R 25a
metallurgy of: R 18d
Platinum metals: B 156-4; 176
Playa del Rey oil field: B 118c
Playas, clay minerals in: SR 69
Pleistocene
correlation of formations in California: B 118b
glaciation: B 170f-6
lakes: B 170f-5; MIS 14-4, 5
Pliocene, correlation of formations in California: B 118b

PLUMAS COUNTY, current mining activity: R 39a
MINES AND MINERAL RESOURCES: RM 2; R 8; 10; 11; 16b; 17; 24d; 33b
Plutonic rocks: MIS 14-6
Poe Tunnel, geologic section and petrography along: SR 61
Point Arena-Fort Ross region, geology and oil possibilities: B 118c
Point Arguello quadrangle, geology of: B 150
Point Conception quadrangle, geology of: B 150
Point Reyes quadrangle, geology of: B 149
Polarograph: J 44d; MIS 1-5
Potash: PR 5; MIS 11-4
Potassium-argon method, dating rocks by: SR 54
Potrero Hills gas field: B 118c
Potrero oil field: B 118c
Pottery: R 9
Poverty Hills diatomaceous earth deposit: J 54c
Pozzolans, in California: MIS 7-10
Poso Creek oil field: AR 10-1
Practical Hydraulics, tables from: R 6b
PROSPECTING, geochemical: B 118a
geomagnetic: R 29a
gold and silver: R 1
gold placer deposits: B 135
Providence Mountains, San Bernardino County
geology: B 170e-4
Public Resources Code, California: B 130; J 44d
Publications, Division of Mines: see under California State Division of Mines
Puente Hills oil field: OM 4
Pulp and paper industry, western: J 45c; MIS 2-2
Pumice: J 43d; 44c; B 156-3; 174; 176; MIS 10-1
see also: Volcanics
Pumicite: B 156-3; 174; 176; MIS 10-1
see also: Volcanic rocks
Pyrites: B 156-3; 176; MIS 11-5
Iron Mountain deposits: SR 14
Shasta King deposits: SR 16
Pyrophyllite: B 156-3; 176; MIS 3-2
marketing of: R 37b
San Dieguito area, San Diego County: SR 4

Q

Quadrangles, geologic: see Maps, geologic quadrangle series
Quail Hill copper area, Calaveras County: B 144
Quail Mountains, San Bernardino County, geology: B 170r
Quail quadrangle, southern, geology of: SR 30
Quartz: R 37c; B 176; MIS 2-12
Quartz crystal: B 156-3; 176
geology of mines near Mokelumne Hill: R 40d
specifications for: R 24c
Quartz family minerals: MIS 12-4
Quartz Spring area, geology: SR 25
Quartzite: B 176
QUICKSILVER: B 156-4; 176; MIS 4-12; 5-12
De argento vivo: J 49c
economic aspects of production: J 44d
exploration program of U. S. Geological Survey: R 37d
geology of deposits: R 33a
history: J 49c
industry, 1952: MIS 5-12
1953: MIS 7-9
New Idria condenser installation: J 43a
purchase program: MIS 7-10
references to publications on: MIS 1-7
statistics on mining and production: R 10; 32c

use in batteries: R 41b
see also: Mercury, and other individual minerals of quicksilver
QUICKSILVER DEPOSITS
Abbott mine, Lake County: MIS 7-10
Altoona mines, Trinity County: J 46c
Cachuma district, Santa Barbara County: J 46d
California: M 18; R 1; 12; 13; 35d; B 27; 78; MIS 5-1
central San Benito and northwestern Fresno Counties: R 41a
Coso Range, Inyo County: R 26a; 38c
Guadalupe mine, Santa Clara County: MIS 10-4; 12-4
Guerneville district: J 44c
Knoxville district: R 41b
Mayacmas district: R 42c
Mount Jackson mine, Sonoma County: MIS 7-10
New Almaden mines: J 49c; B 154-5; SR 17
New Idria district: R 39a; 42b; 43a; MIS 7-10
Oakville district, Napa County: J 45a
San Francisco Bay area: B 154-5
Skaggs Springs mine, Sonoma County: J 46c
Stayton district, San Benito, Santa Clara, and Merced Counties: B 147
Sulphur Bank mine, Lake County: R 42b
Walibu mine, Kern County: J 43a
Quien Sabe quadrangle, geology of: B 147

R

Radioactive deposits, California: SR 49; MIS 7-10
Radioactivity, at The Geysers: R 18j
Randsburg quadrangle, geology and ore deposits: B 95
Rare earths: B 156-4; 176; MIS 3-3; 10-6
Mountain Pass deposits: B 170i-3; MIS 5-7
references on: MIS 5-8
see also under names of rare-earth elements, Monazite
Red Mountain magnesite district: J 46b; B 154-5
Red Rock mining district, Kern County: R 12
Redrock Canyon area, geology: B 170r
Redding field district, mines and mineral resources: R 17; 19; 39a,c; J 44d
Redding quadrangle, geology and gold deposits: R 29a
Refining, precious metals: R 9
Relief model of California, history of: MIS 6-4
Republic area, Midway-Sunset oil field: B 118c
Research program, proposed: J 54c
Resting Springs region, Inyo County, geology and mineral resources: R 33d
Richfield oil field: OM 4; AR 12-6; B 118c
Ridge Basin, geology of: SR 26; B 170r
Rincon Hill well, San Francisco: R 10
Rincon oil field: OM 33; B 118c; 170r
Rio Bravo oil field: B 118c
Rio Vista gas field: B 118c
RIVERSIDE COUNTY: B 170
clay deposits: R 19d; 31a
Crestmore minerals: R 39c
Eagle Mountains iron-ore deposit: B 129a
geology: R 40a; 42a
Joshua Tree National Monument: SR 68
Jurupa Mountains, geology: SR 5
Lake Elsinore quadrangle, geology of: B 146
MINES AND MINERAL RESOURCES: R 15d; 17; 20c; 25d; 41c
Palen Mountains gypsum deposit: SR 36
Perris block: R 31d
Road logs
Mother Lode region: B 141
San Francisco Bay area: SP 32; B 154-7
Rodgers, Thomas H.: MIS 12-9
Roofing granules: J 45c; MIS 1-4
Rosamond uranium prospect: SR 37

Rosamond Hills, geology: B 170r
Roscoelite: R 2
Rosecrans oil field: OM 30; AR 11-5
Ross strontianite deposit: SR 32
Round Mountain oil field: OM 35; B 118c
Rubber industry, minerals used in: J 45d; MIS 2-6
Rumsey Hills area, geology and oil possibilities: B 118c

S

SACRAMENTO COUNTY
  Antioch quadrangle, geology of: B 149
  geologic guidebook: B 154
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 15c; 17; 21a; J 51b
Sacramento field district, strategic minerals in: R 39a,b,c,d
Sacramento Valley, basement complex: J 44b
Sacramento Valley, northern, Tertiary formations of: R 35c
Safety work, U. S. Bureau of Mines: J 46c
Saline deposits
  Bristol Dry Lake: SR 13
  California: M 15; B 24
  Mojave Desert: MIS 10-8
  Searles Lake: R 41d
  see also: Alum; Borax; Salt
Saline Valley area: MIS 8-8
Salines: B 156-3; 176
  San Francisco Bay area: B 154-5; MIS 5-2
  southern California: B 170i-1,2
Salt: R1; 2; 42d; B 175; 176; MIS 3-12; 5-12; 7-2; 11-7
  see also: Salines
Salt Lake oil field: OM 6; B 118c
Saltcake, in California: J 44b; MIS 3-12
Saltdale quadrangle: B 160
San Andreas fault: B 170e-5; SR 57
Sampling, gold placer deposits: B 135
  gold quartz deposits: R 30a
  in mine examinations: R 13
  mineral deposits: MIS 13-11
  ore bodies: R 13
SAN BENITO COUNTY
  Gabilan Range, limestone and dolomite in: SR 56
  geology: R 12
  Granite Rock Co. operations: B 133
  Hollister quadrangle, geology of: B 143
  Jadeite in: SR 10C
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 15e; 17; 18e; 22b; J 43a
  New Idria district quicksilver deposits: R 39a; 42b; MIS 7-10
  Ortigalita Peak quadrangle, geology: B 167
  perlite discovered in: MIS 6-6
  Quien Sabe quadrangle, geology of: B 147
  San Benito quadrangle: R 39b
  Stayton district, quicksilver and antimony in: B 147
SAN BENITO COUNTY, CENTRAL, quicksilver deposits of: R 41a
San Benito quadrangle, geology: R 39b
SAN BERNARDINO COUNTY: B 170
  Barite near Barstow: SR 39
  Barstow quadrangle: B 165; R 40a
  Bristol dry lake, salines: SR 13
  celestite deposits: SR 32
  Chino area, oil: B 118c
  geology: R 8; 11; 40a
    Newberry and Ord Mountains: R 36c
  iron deposits: R 42d; B 129b,c,d,e,f,g,h,m
  Johnston Grade area, geology of: SR 31
  Joshua Tree National Monument: SR 68

Jurupa Mountains, geology: SR 5
MINES AND MINERAL RESOURCES: RM 11; R 8; 9; 10; 11; 15f; 17; 19d; 26c; 27c; 39d; 49a
San Bernardino Mountains, geology: SR 65
Silver Lake talc deposits: SR 38
Starbright tungsten mine: J 48c
strontianite deposits: SR 32
San Bernardino Mountains, geology: SR 65
SAN DIEGO COUNTY: B 170
celestite deposits: SR 32
dimension stone, granitoid: SR 3
geology: R 8; 11; 35a; B 159; 170c-4
ironstone concretions and beach ridges in: J 46b
Julian district, mines and mineral resources: R 30c
Julian—Cuyamaca area, geology: R 42a
Lake Elsinore quadrangle, geology of: B 146
MINES AND MINERAL RESOURCES: RM 14; R 6a; 8; 9; 10; 11; 14e; 17; 20d; 21c; 35a
oil and gas possibilities: R 35a; B 118c
Otay bentonite deposit: SR 64
pegmatites: SR 7A,B
San Dieguito pyrophyllite area: SR 4
Santa Ysabel quadrangle: B 177
San Dieguito pyrophyllite area, San Diego County: SR 4
San Emidio oil field: OM 7
San Francisco, water for: MIS 10-8
San Francisco Bay
geologic history: B 154-2
geology of area north of: B 149
San Francisco Bay area:
aerial guide: MIS 2-2
geologic guide and log: SP 32; MIS 2-2
geologic maps covering: MIS 5-2
mineral resources: MIS 8-4
San Francisco Bay counties, geologic guidebook: B 154; MIS 5-2
SAN FRANCISCO COUNTY, auriferous beach sands: R 10
earthquakes, 1957: SR 57; MIS 10-5
geologic guidebook: B 154
MINES AND MINERAL RESOURCES: R 8; 17; 25b
San Francisco field district, mines and mineral resources: R 17; 19; 31a; 39a
San Gabriel fault: B 170e-6
San Gabriel Mountains, eastern, mylonites in: R 39b
San Gabriel Mountains, western
anorthosite complex: B 170h-8
geology: R 33c; B 170r
titaniferous iron-ore deposits of: B 129p
San Gorgonio Pass, geology of: B 170r
San Jacinto quadrangle, geology south of San Gorgonio Pass: R 27d
mineral deposits of: R 28a
San Joaquin basin, glaciation in: B 170f-6
SAN JOAQUIN COUNTY
geologic guidebook: B 154
manganese mining in: MIS 4-6
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14d; 17; 21b; J 51a
Tesla quadrangle, geology of: B 140
San Joaquin Valley
basement complex: J 44b
geology: B 170c-8
oil-producing zones of: B 118b,c
San Jose Hills, geology and oil prospects: J 46b
San Juan Bautista quadrangle, geology: B 133
SAN LUIS OBISPO COUNTY, chromite deposits: R 39a
concretions from Templeton: J 44c
geology: R 12

MINES AND MINERAL RESOURCES: R 8; 10; 15e; 17; 21d; 31d
oil fields: AR 2-3; 3-5
San Luis Rey quadrangle: B 159
SAN MATEO COUNTY
Calera limestone in: SR 1B
cinnabar in: MIS 8-7
geologic guidebook: B 154
manganese discovery in: R 39b
MINES AND MINERAL RESOURCES: R8; 10; 17; 25; J 51d
San Andreas fault in: SR 57
San Miguel Island: see Channel Islands
San Miguelito oil field: B 170r
San Nicolas Island, geology: R 9
Sanbornite: R 28a
Sand: J 52a; 54b; B 156-3; 176; MIS 8-12; 9-5; 11-6
California deposits: B 180
Kern River: SR 70
specialty: B 176
see also under: Beach sands; Black sand; Glass sand; Foundry sands
Sandblasting materials: MIS 3-5; 11-11
Santa Ana Mountains, Cretaceous formations of: B 118b
Santa Ana Narrows area, geology: B 178
SANTA BARBARA COUNTY
Cachuma quicksilver district: J 46d
Gaviota quadrangle, geology of: B 150
geology of: R 12
Lompoc diatomite deposits: R 32b
Lompoc quadrangle, geology of: B 150
Los Olivos quadrangle, geology of: B 150
MINES AND MINERAL RESOURCES: RM 20; R 8; 10; 15e; 17; 21d
oil and gas yielding formations in: B 11
oil fields: AR 2-3; 3-5
oil shale in: R 19d
Point Arguello quadrangle, geology of: B 150
Point Conception quadrangle, geology of: B 150
Sierra Blanca limestone in: SR 1A
Santa Barbara County, southwestern, geology of: B 150
Santa Catalina Island, mines and mineral resources: R23a
SANTA CLARA COUNTY
Calera limestone in: SR 1B
geologic guidebook: B 154
Guadalupe quicksilver mine: MIS 10-4; 12-4
Hollister quadrangle, geology of: B 143
MINES AND MINERAL RESOURCES: R 8; 9; 10; 11; 17; 26a; J 50b
New Almaden quicksilver mine: SR 17
oil fields: AR 2-3; 3-5
Quien Sabe quadrangle, geology of: B 147
Red Mountain magnesite district: J 46b
Stayton district, quicksilver and antimony in: B 147
SANTA CRUZ COUNTY, MINES AND MINERAL RESOURCES: R 8; 10; 17; 22a; 39a
Santa Cruz Island, geology: R 9; 27b
see also: Channel Islands
Santa Fe Springs oil field: OM 27; AR 8-11; 14-7; B 118c
Santa Maria district
oil fields: OM 1; 2; AR 1-5
oil-producing zones of: B 118b
Santa Maria oil field: OM 2; 3; RM 20; B 118c
Santa Maria River, ground-water geology: R 10
Santa Maria Valley oil field: B 118c
Santa Monica Mountains
geology of: R 34b; B 170r
marine terraces: B 170f-7
Santa Paula oil field: O M17; B 118c; 170r

Santa Rosa Island: see Channel Islands
Santa Rosa lead mine: SR 34
Santa Rosa Mountain area, Riverside County, geology: R 42a
Santa Rosa quadrangle, geology of: B 149
Santa Ysabel quadrangle: B 177
Sargent oil field: OM 1; B 118c
Scheelite
  crystals: MIS 10-5
  fluorescence of: R 37d
  molybdenum in: R39a
  occurrence in Idaho-Maryland mine: R 37b
  prospecting for: R 34c
  see also: Tungsten
Scintillation counter, new: MIS 8-3
Scotia quadrangle, geology: B 164
Sea floor deposits: see submarine deposits
Seal Beach oil field: OM 32; AR 13-3; B 118c
Sebastopol quadrangle, geology: B 162
Sediments
  grain size of fragmental: MIS 13-9
  Monterey Bay: R 28a
  strength of central California: J 54b
Selenium: MIS 6-11
  references on: MIS 10-8
Semitropic gas field: B 118c
Sequoia National Park, geology: SR 53
Serpentine
  in California: MIS 6-4
  in San Francisco Bay region: B 154-5
Sespe Creek area, geology: B 170r
Sespe oil field: OM 17; B 118c
Shadow Mountains, geology: B 170r
Shale, expansible: B 176; MIS 7-10; 13-5
Shale survey: MIS 13-3
Shasta and California iron-ore deposits, Shasta County: B 129k
SHASTA COUNTY
  Afterthought mine: SR 29
  Big Bend quadrangle, geology and paleontology: SR 63
  copper deposits: R 20d; 43b; SR 28; 29
  geology: R 11
  gold dredging in: R 34b
  Hirz Mountain iron-ore deposits: B 129j
  Iron Mountain sulfide deposits: SR 14
  limestone deposits on McCloud River: R 18b
  Mammoth mine: SR 28
  MINES AND MINERAL RESOURCES: RM 10; R 8; 10; 11; 14f; 17; 18i; 22b; 35b
  Mountain Copper Co.: R 43b
  Shasta and California iron-ore deposits: B 129k
  Shasta King mine: SR 16
  South Fork mining district, gold lodes: R 18g
  West Shasta copper-zinc district: MIS 10-8
Shasta King mine, Shasta County: SR 16
Shasta quadrangle, economic geology of: R 27a
Shells, catalogue of west North American and foreign: SP 8
Shiells Canyon area, Bardsdale oil field: B 118c
Ship Mountains iron-ore deposit, San Bernardino County: B 129h
Sierra Blanca limestone, Santa Barbara County: SR 1A
SIERRA COUNTY
  Alleghany district, quartz mining in: R 18j; J 52c
  iron-ore deposits near Lake Hawley and Spencer Lakes: B 1291
  MINES AND MINERAL RESOURCES: RM 15; R 6b; 8; 10; 11; 16c; 17; 20d; 25b; 38a

SIERRA NEVADA, genesis and metamorphism of manganese deposits: B 125
geology and tungsten deposits northeast of Visalia: R 39b
geomorphic province: B 141
SIERRA NEVADA, NORTHERN, geology: R 28c
Sierra Nevada province, chromite in: B 134c
Sierran gold belt, guidebook to: B 141
Silica
commercial: MIS 10-4
opaline, industrial applications of: R 32d
Silica deposits, California: R 27c
see also: Foundry sands
Sillimanite: R 39c; B 156-3
Silurian Hills, geology: B 170r
Silver: J 43d; B 156-4; 176; MIS 1-11
refining and coining: R 9
Silver deposits, California: R 9; 12; 13
Calistoga mines: R 6a
Darwin quadrangle: SR 51
Mojave Desert: B 170i-6
South Fork mining district, Shasta County: R 18g
see also: Galena, argentiferous
Silver Lake district, San Bernardino County
iron deposits: B 129c
talc deposits: SR 38
Simi oil field: OM 18; B 118c
SISKIYOU COUNTY, chromite deposits: R 39a; B 134 a2
circular soil structures: B 151
dragline dredging in: R 37b
Gazelle region, geology of limestone deposits in: J 45d
gold dredging in: R 34b
Macdoel quadrangle, geology: B 151
MINES AND MINERAL RESOURCES: RM 3; R 8d; 10; 11; 14f; 17; 21; 31c; J 43d
Sites region, geology and oil possibilities: B 118c
Skaggs Springs, quicksilver mine, Sonoma County; J 46c
Skin-diving for gold: MIS 13-6
Slate: B 156-3
Chili Bar mine: MIS 7-10
quarrying: R 9
Smelting: see Metallurgy and ore-dressing
Smith, W.S.T., library gift from: MIS 9-1
Soapstone: B 156-3; 176
marketing: R 37b
Soda ash: MIS 3-12
at Owens Lake; MIS 12-110
in California: J 44b
Sodium: MIS 1-6
Sodium carbonate: B 176
Sodium Sulfate: B 176
Soil mechanics: B 169
Soils
California: B 155
clay in: B 169
SOLANO COUNTY
Antioch quadrangle, geology of: B 149
Carquinez quadrangle, geology of: B 149
geologic guidebook: B 154
Mare Island quadrangle, geology of: B 149
MINES AND MINERAL RESOURCES: R 8; 10; 14b; 17; 23b
Mount Vaca quadrangle, geology of: B 149
Vacaville quadrangle, geology of: B 149
Soledad basin, Los Angeles County, geology: B 170r
Soledad quadrangle, geology and oil possibilities: B 118c
Solomon strontianite deposit: SR 32

SONOMA COUNTY
geologic guidebook: B 154
Guerneville district quicksilver deposits: J 44c
Lower Lake quadrangle, geology: B 166
Mare Island quadrangle, geology of: B 149
Mayacmas district quicksilver deposits: R 42c
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14b; 17; 22c; J 46a
Mount Jackson quicksilver mine: MIS 7-10
Perlite deposits: J 46a
Petaluma quadrangle, geology of: B 149
Point Reyes quadrangle, geology of: B 149
Santa Rosa quadrangle, geology of: B 149
Sebastopol quadrangle, geology: B 162
Skaggs Springs quicksilver mine: J 46c
Sonoma quadrangle, geology of: B 149
The Geysers: R 18j; 42c
SONOMA COUNTY, NORTHERN, carbon-dioxide gas in: R 39c
Sonoma quadrangle, geology of: B 149
Sonora quadrangle, geology: SR 41
Sonora region, Tuolumne County, limestone in: J 45d
South Fork mining district, Shasta County, silver lodes: R 18g
South Mountain oil field: OM 17; AR 7-12; B 118c; 170r
Spectrograph: J 44d; MIS 1-5; 11-8
Spencer Lakes iron-ore deposits, Sierra County: B 1291
Springs, desert fissure, in San Bernardino County: RM 11
Springs, mineral
California: R 6a; 12; 13
Lake County: J 50b
Standard quadrangle, limestone and dolomite in: SR 58
Stanford University Geological Survey, map of part of Foothill copper belt by: R 39d
STANISLAUS COUNTY
Copperopolis quadrangle, geology of: B 145
MINES AND MINERAL RESOURCES: R 8; 10; 11; 14d; 17; 21b; J 43b
Red Mountain magnesite district: J 46b
Starbright tungsten mine, geology: J 48c
State geological surveys: J 45b
State Mineralogist
Annual Report of: R 55; 56; 57; J 43d; 45a; 46a; 47b; 48a; 49a; 50c; 52a, d; 54a
Biennial Report of: SP 14; 15; 16; 17; 18; R 24d; 26d; 28c; 30c; 32d; 34; 36d; 38c; 40d; 42c
State Mineralogists
Campbell, Ian: MIS 12-1
Hamilton, Fletcher M.: MIS 12-1
Jenkins, Olaf P.: MIS 11-2
Oakeshott, Gordon B.: MIS 11-4
State Oil and Gas Supervisor, Annual Report of: AR 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14
Statistics, California mineral production: M 3; SP 19; R 6b; 18j; 55; 56; 57; J 47b; 48d; 50a,c; 51d; 54a; B 7; 8; 12; 13; 14; 17; 21; 22; 25; 26; 28; 29; 33; 34; 39; 40; 42; 43; 47; 48; 51; 52; 53; 54; 55; 56; 58; 59; 60; 61; 62; 64; 65; 68; 70; 71; 74; 83; 86; 88; 90; 93; 94; 96; 97; 100; 101; 102; 103; 105; 107; 109; 110; 111; 112; 114; 116; 117; 119; 121; 122; 126; 128; 130; 132; 137; 139; 142; 156; MIS 1-1, 5, 6, 7, 9, 10; 2-2, 8, 10; 3-1, 2, 3, 7; 4-2, 3, 5, 8; 5-4, 7, 8, 9; 6-2, 4, 8, 10, 12; 7-2, 4, 6, 8, 10; 8-1, 6, 7, 10; 9-2, 4, 9; 10-2, 3, 8; 11-1, 11; 12-1, 11; 13-2, 4, 10; 14-2
natural gas production: see Statistics, oil and gas production
oil and gas production: AR 1; 1-6; 2; 3; 4; 5; 5-12; 6; 6-8; 7; 7-2; 11; 8; 8-2; 9; 9-2; 10; 10-2; 11; 11-2; 12; 12-2; 13; 13-2; 14; 14-2; B 118a; also included under Statistics, California mineral production
policy regarding release of: MIS 1-4, 8
quicksilver: R 10
see also: California, mines and minerals of; see also under mineral names
Statistics, U.S. mineral production: R 6b; 7; 9; 55; 56; J 54a

Stayton district, quicksilver and antimony in: B 147
Steatite talc, Inyo County: SR 8
Steel, boron: MIS 6-4
Stockpiles: MIS 2-1; 3-9
Stone: B 156-3; 176
  dimension: MIS 7-3
  see also Building materials
Strand oil field: B 118c
Strategic minerals: R 34c; 36a,d; 37a; 39a; 41a; MIS 3-8
  in Sacramento field district: R 39a,b,c,d
  loans for developing: MIS 3-12
  sources of information on: MIS 3-10, 12
  stockpiling of: MIS 3-9
  U.S. geological Survey publications on: R 39a
Stratigraphy: see Geology, stratigraphic
Stream deposits, glacial, Sierra Nevada: R 28c
Strontianite, southern California: SR 32
Strontium: PR 5; B 156-3; 176
  deposits, southern California: SR 32
Structure: see Geology, structural
Structural materials: see Building materials
Submarine geology, southern California: B 170c-7,f-4
Submarine manganese deposits: J 51c
Submarine phosphorite, off California coast: J 46a
SUBMARINE TOPOGRAPHY, canyons off California coast: R 34c
  Monterey Bay: R 28a
Subsidence
  in California: MIS 8-7
  in Wilmington oil field: B 170k-3
Substitution, in mineral industry: MIS 13-8
Sulfur: B 156-3; 176; MIS 3-6; 11-5
  agricultural: B 155
  deposits, Inyo County: R 34d
Sulfuric acid: B 156-3; 176
  agricultural: B 155
Sulphur Bank quicksilver mine, Lake County: R 42b
Summary of operations, California oil fields: AR 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14
Summerland, natural-gas well at: R 10
Summerland oil field: RM 20; B 118c
Summit mining district, Kern County: R 12
Sunset oil field: OM 7; AR 9-5; 12-11
  see also: Thirty-Five Anticline
Sunset Extension oil field: AR 9-12
Superior talc area: SR 20
Surface rights: see under Mining law
Sutter Buttes gas field: see Marysville Buttes gas field
SUTTER COUNTY, Marysville Buttes gas field: R 39c; B 118c
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 15b; 17
Symons, Henry H., retirement: MIS 13-3

T

Tailing wheels, Kennedy gold mine: MIS 11-7
Talc: R 27a; B 156-3; 176; MIS 1-4; 2-5; 9-11
  Death Valley: SR 20
  in paint industry: J 48c
  Inyo County: SR 8
  marketing of: R 37b
  Silver Lake: SR 38
Tantalum: MIS 4-5; 6-4; 12-3
Tar sands, Huntington Beach oil field: AR 13-11
Tariff rates: see Mineral economics
Tehachapi Mountains, geology: B 170c-9
TEHAMA COUNTY, geology: R 11;
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 15b; 17; 24c; 42c
  North Elder Creek area chromite deposits: R 39a
Tejon formation, type locality of the: B 118c

Tellurium: MIS 6-11
Tembor oil field: B 118c
Ten Section oil field: B 118c
Terrace, marine: B 170f7
Tertiary
basins, southern California: B 170d-8
channels: see Gold, geology of placer
correlation of California: B 118b
formation, northern Sacramento Valley: R 35c
volcanic domes near Jackson: SR 60
Tesla quadrangle, geology of: B 140
Tetrapods, concrete: MIS 9-12; 10-1
Thirty-Five Anticline, Sunset oil field: AR 9-5; 12-11
Thorium: B 156-4; 176
Ticks, danger from: MIS 12-4, 7
Tidelands oil bill: MIS 1-8
Tiefort Mountains iron deposit, San Bernardino County: R 42d
Tile, glazed: MIS 6-6
Timber, preservation of: R 13
Tin: PR 5; R 1; B 156-4; 176
deposits, California: R 37d
Gorman district, Kern County: R 42a
Titaniferous iron-ore deposits, Los Angeles County: B 129p
Titanium: B 156-4; 176; MIS 9-3
utilization and metallurgy: R 23c; J 49b
Topanga Canyon quadrangle, geology: R 34b
Topographic mapping
application of aerial photography to: AR 5-9
increased usefulness: MIS 2-8
program for California: R 28a
status in California: R 40b
status in United States: J 43c
Topographic maps: MIS 6-2
announcements of release of new: MIS 3-1, 2, 3, 4, 5, 9, 11, 12; 4-4, 6, 7, 8, 9, 10, 11, 12; 5-2, 4, 5, 6, 7, 8, 12; 6-1, 2, 3, 4, 8, 9, 10, 12; 7-1, 3, 4, 5, 6, 7, 9, 10, 12; 8-1, 3, 6, 7, 8, 9, 11; 9-1, 2, 3, 5, 6; 10-1, 2, 6, 9
Topographic quadrangles, index to California: R 41d
Topography, submarine: see Submarine topography
Torrance oil field: OM 28; AR 11-3; B 118c
Town—lot area, Huntington Beach field, tar sands in: AR 13-12
Township and range system, California, index to: B 118b
Township plats, see under Maps
Tracy gas field: B 118c
Tracy region, Delta-Mendota Canal: SR 2
Transverse Ranges, geology: B 170c-6
Trico gas field: B 118c

TRINITY COUNTY
Altoona quicksilver mine: J 46c
Clerbus-Mae tungsten prospect: R 39b
East Fork mining district, gold lodes: R 18F
gold dredging in: R 34b
Island Mountain copper mine: J 53a
MINES AND MINERAL RESOURCES: RM 4; R 8; 10; 11; 14f; 17; 22a; 37a
Trustees of the State Mining Bureau, reports of: SP 10; 13; 14; 15; 16; 17; R 6b: 7; 8; 9; 10; 11; 12; 13
Tujunga quadrangle, anorthosite-gabbro rocks in: B 172

TULARE COUNTY, chromite deposits of: B 134c3
MINES AND MINERAL RESOURCES: R 8; 10; 11; 15f; 17; 18j; 26d; J 54c
oil fields: AR 3-6
Sequoia-Kings Canyon National Parks, geology: SR 53
studied: MIS 11-9
tungsten deposits: SR 35
Tulare Lake gas field: AR 5-6; 8-1

Tungsten: PR 4; B 156-4; 176; MIS 3-6; 4-10; 5-12; 9-6
found in Coast Ranges: MIS 4-9
guaranteed price: MIS 4-6
purchase: MIS 4-9, 12
tariff rates: MIS 4-1
see also: Scheelite; Mineral economics, marketing
TUNGSTEN DEPOSITS
Adamson mine: R 41d
Bishop district: SR 47
California: R 37b,d
tabulation to accompany map showing: R 38c
Clerbus-Mae prospect, Trinity County: R 39b
Confidence mining district, Tuolumne County: R 38c
Darwin quadrangle: SR 51
Fresno County: SR 35
Madera County: R 38c; SR 35
Pine Creek: R 41d; SR 47
Sierra Nevada, northeast of Visalia, Tulare County: R 39b
southern California: B 170i-4
Starbright mine, San Bernardino County: J 48c
Tulare County: SR 35
Tungsten Hills, Inyo County: J 46a
Tungsten Hills, Inyo County, geology and tungsten deposits: J 46a
Tungsten ores, molybdenum in: MIS 5-4
Tunis area, geology: B 170r
TUOLUMNE COUNTY
Sonora quadrangle, geology: SR 41
chromite: B 134c1
Confidence mining district, tungsten deposits: R 38c
Copperopolis quadrangle, geology of: B 145
MINES AND MINERAL RESOURCES: RM 16; R 6b; 8; 10; 11; 14a; 17; 24a; J 45a
Sonora region, geology of limestone deposits in: J 45d
Standard quadrangle, limestone and dolomite in south half: SR 58
Turner, Mort D.: MIS 7-11
Turtlebacks: B 170e-7
Twenty-five Hill area, Midway-Sunset oil field: B 118c
Twin Lakes region, Fresno County, contact-metamorphic rocks: R 38c

U

Ubehebe Peak area, mineral deposits: SR 42
Ultra-violet light, use in prospecting for scheelite: R 34c
Uranium: J 44a, d; B 156-4; 176; MIS 2-8; 7-7, 10, 11, 12; 8-1, 5; 12-1
aerial exploration for: MIS 8-4
bonus for: MIS 4-5
domestic program: MIS 1-7
Rosamond prospect, Kern County: SR 37
with copper: MIS 8-3
Urbanization and the mineral industry: SP 30; MIS 12-12
U.S. Atomic Energy Commission: J 44d
U.S. Bureau of Land Management: MIS 7-7
U.S. Bureau of Mines
defense exploration projects: MIS 5-10
Director: MIS 9-10
health and safety work of: J 46c
metal, mineral, fuel reviews: R 55; 56; J 54a
offices moved: MIS 7-7
strategic minerals investigations: R 36a; B 129o
U.S. Department of Interior Minerals and Energy Administration: MIS 3-11
U.S. Geological Survey
Chief Geologist: MIS 12-11
exploring desert borates: MIS 10-6, 8
Map Information Office: R 42d; J 43c
map symbols used in publications of the: J 45a
maps compiled from work of: RM 12; 15; 16; 19; 21

office: MIS 9-8, 10; 12-12
open-file reports: MIS 4-6, 9; 5-5, 6; 7-6; 10-2, 6; 11-7
program in California: R 55; 56; 57; J 52a, d; 54a
Public Inquiries Office: MIS 6-8
publications on strategic minerals: R 39a; see also Strategic minerals
quicksilver program of the: R 37d
Wrather retirement: MIS 9-3
U.S. Naval Petroleum Reserve No. 1 (Elk Hills oil field): B 118c

V

Vacaville quadrangle, geology of: B 149
Van Deinse, F. C., necrology: MIS 8-8
Vanadium: PR 4; J 43b; 176
Vaqueros formation, type locality of the: B 118c
Ventura Avenue oil field: B 118c; MIS 7-5
Ventura Basin
foraminifera: B 170d-5
geologic guide: B 170m; SP 25
geology: B 170r
marine terraces: B 170f-7
VENTURA COUNTY: B 170
asphaltum in: R 10
geology: R 8, 12
hydrology: B 170g-3
Lebec quadrangle, geology: SR 24
MINES AND MINERAL RESOURCES: R 8; 10; 15e; 17; 21b; 28c
oil and gas yielding formations: B 11
oil fields: AR 1-4; 2-2; 3-4; 10-5
Ventura [Avenue] oil field: OM 16; AR 5-8; 6-6; 11-10; 12-3
Ventura School for Girls, oil possibilities: SP 31
Vermiculite: B 176
marketing of: R 40d
Vivianite: R 2
Volcanic cinders: B 174; 176; MIS 10-1
Volcanic domes, Tertiary: SR 60
Volcanic rocks: MIS 6-7
Miocene, in southern California: B 170h-4
use in San Francisco Bay area industry: B 154-5
see also: perlite, pumice, pumicite
Vulcan iron-ore deposit, San Bernardino County: B 129f

W

Walibu quicksilver mine, Kern County: J 43a
Wasco oil field: B 118c
Wasson, Joseph, death of: R 3
Water
in bedrock, western San Diego County: B 159
in California: R 6a; 13
in oil fields, damage by: PR 1, 2
in San Francisco Bay region: B 154-6; MIS 10-8
see also: Ground-water; Springs
Water-flooding in California oil fields: J 45b,c,d; MIS 2-2
Water rights: See Mining law
Water supply, protection of domestic: B 135
Water wheels: R 8
Weaverville quadrangle, geology and gold deposits: R 29a
Welding electrodes: J 51a
Well samples, basement complex in: J 44b
Wells, exploratory: B 118d; SR 23
Wells, Fargo & Co.: R 6b; 7
Welsh tungsten deposits, Madera County: R 38c
West Point tunnel, Amador County, geology: J 46a
West Shasta copper-zinc district: MIS 10-8
West Yellowstone earthquake: MIS 12-10
Western Governors Mining Advisory Council: J 52d; MIS 12-7

Wheeler Ridge oil field: AR 9-12; B 118c
"White metal": R 22a; 38b
Whittier oil field: OM 4; 5; B 118c
Whittier-La Habra area, geology: SR 18
Wildcat wells: AR 11-1; 12-8; 13-8; 14-8; B 118c
Williams area, Midway-Sunset oil field: B 118c
Willows gas field: B 118c
Wilmington oil field: B 118c; 170r
  earthquake damage: MIS 8-7
  subsidence: B 170k-3
Withdrawals: see Mining law
Wollastonite: B 176; MIS 5-6; 7-10; 8-4
World Fairs: R 5
Wrather, W. E., retirement: MIS 9-3

Y

Yellowstone earthquake: MIS 12-10
YOLO COUNTY
  Cache Creek, sand and gravel resources: J 54b
  geologic guidebook: B 154
  geology: R 10
  MINES AND MINERAL RESOURCES: R 8; 10; 11; 14b; 17; J 46c
  Knoxville district, quicksilver deposits of: R 41b
Yorba Linda area, Coyote Hills oil field: B 118c
YUBA COUNTY, MINES AND MINERAL RESOURCES: RM 21; R 8; 10; 11; 15c; 17; 26c; 27c; J 48b

Z

Zeolite, synthetic: MIS 5-4
Zinc: J 53b; B 156-4; 176; MIS 1-12; 9-7
  Afterthought mine: SR 29
  Foothill copper belt: B 144
  Iron Mountain sulfide: SR 14
  Mammoth mine: SR 28
  Shasta King mine: SR 16
  West Shasta district: MIS 10-8
Zirconium: B 156-4; 176; MIS 1-1; 3-3; 7-9

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